apple service

LEVEL I
TECHNICAL PROCEDURES
#072-0062

®

IMPORTANT

1. **YOU MUST COMPLETE THIS CARD!**

2. Your service manuals are updated monthly. This card registers you for the updates.

3. To keep your manuals up to date, we must know the current update numbers. These numbers are found on the last page of each manual (Document Control Sheet.)

COPY THESE NUMBERS ONTO ATTACHED CARD.

4. Mail Card.

YOU WILL NOT BE SENT UPDATES IF YOU DO NOT COMPLETE THIS CARD!!!

Dealership Name ______________________

Attn. Name ______________ Dealer Number ______________

Address ______________________

City ______________ State ______ Zip ______

Current Technical Procedures update # 1

Current Service Programs update # ______

(copy from last page of binder "Document Control Sheet")

NO POSTAGE
NECESSARY
IF MAILED
IN THE
UNITED STATES

BUSINESS REPLY CARD

FIRST CLASS PERMIT NO. 453 CUPERTINO, CA

POSTAGE WILL BE PAID BY ADDRESSEE

Apple Computer — Service Binder Updates
Service Documentation and Publication - M/S 18I
20525 Mariani Ave
Cupertino, CA 95014

apple computer inc.

TECHNICAL PROCEDURES

apple computer inc.

APPLE TECHNICAL RESOURCES - for the Dealer Technician

RECOMMENDED TECHNICAL RESOURCES	Ordering Info
Manual, Apple II Ref	030-0004
Parallel Printer Manual	030-0005
Manual, "Comm Card Oper"	030-0008
Mnl, "Applsft2 Basic Prog Ref"	030-0013
Operating Instruction, Int. ROM Cd.	030-0062
Manual, Apple Pascal Oper Sys Ref	030-0100
Manual, Ref Apple Pascal Language	030-0101
Manual, DOS 3.3	030-0115
Manual, Apple /// Owner's Guide	030-0121
Manual, AP Business Basic Vol 1	030-0122
Manual, Std Input/Output Drivers	030-0143
Manual, A3 Pascal Prog. Vol 1	030-0237
Mnl.Intro.Filer & Editor Pascal A3	030-0238
Manual, A3 Pascal Pgrm. Prep. Tools	030-0239
Manual, A3 Pascal Prog. Vol II	030-0242
Manual, Universal Parallel Int.Cd.	030-0255
Manual, Super Serial Card	030-0270
User's Manual, Profile for A3	030-0272
Manual, A3 Business Basic Vol 2	030-0292
Apple //e - Owner's Manual	030-0356
Manual, A//e Reference	030-0357
Manual, A//e Applesoft Prog Ref	030-0359
Mnl, Parallel Interface Card	030-0371
Manual, 80 Column Text Card	030-0408
Mnl, Applesoft, Reference, Vol.2	030-0507
Manual, Answer Book 2-SVC	072-0011
Mnl,Softcard /// Install.&Operation	076-0003
Manual,CP/M Reference	076-0004
Manual, Microsoft Basic Reference	076-0005

**Above manuals available from Apple Computer Inc.

Apple Tech Notes ($37.95)

International Apple Core
908 George St.
Santa Clara, CA 95050
(408) 727-7652

apple computer inc.

DEALER TECHNICAL SUPPORT LINES

The technical support lines listed below are for your use only. Do NOT give these rumbers to your customers.

IF YOU ARE IN: (NORTH & SOUTHWEST, ROCKY MOUNTAINS, NO. CALIF/NEVADA)

ALASKA	MONTANA	WASHINGTON	
ARIZONA	NEW MEXICO	WEST TEXAS	
NO.CALIF.	NO. NEVADA	WYOMING	DEALERS ONLY: CALL
COLORADO	OREGON		(408) 745-6735
IDAHO	UTAH		Sunnyvale, CA

IF YOU ARE IN: (SO.CALIF/NEVADA, HAWAII)

SO. CALIF	SO.NEVADA	HAWAII	DEALERS ONLY: CALL
			(714) 549-9510
			Irvine, CA

IF YOU ARE IN: (SOUTH CENTRAL, GREAT PLAINS)

ARKANSAS	MISSOURI	
SO.ILLINOIS	NEBRASKA	
IOWA	OKLAHOMA	DEALERS ONLY: CALL
KANSAS	TEXAS	(214) 323-5430
LOUISIANA		Carrollton, TX

IF YOU ARE IN: (OHIO VALLEY, NORTH CENTRAL)

INDIANA	NO.ILLINOIS	SOUTH DAKOTA	
KENTUCKY	NORTH DAKOTA	WEST PENN.	
MICHIGAN	OHIO	WEST VIRGINIA	DEALERS ONLY: CALL
MINNESOTA		WISCONSIN	(312) 577-3777
			Chicago, IL

IF YOU ARE IN: (MID-ATLANTIC AND SOUTHEAST)

ALABAMA	MARYLAND	SOUTH CAROLINA	
FLORIDA	MISSISSIPPI	TENNESSEE	
VIRGINIA	WASHINGTON D.C.		DEALERS ONLY: CALL
GEORGIA	NORTH CAROLINA		(704) 527-4810
			Charlotte, NC

IF YOU ARE IN: (NEW ENGLAND & NEW YORK)

CONNECTICUT	NEW HAMPSHIRE	NEW YORK	
MASSACHUSETTS	DELAWARE	RHODE ISLAND	DEALERS ONLY: CALL
MAINE	NEW JERSEY	VERMONT	(617) 481-2840
EAST PENN.			Marlborough, MA

IF YOU ARE IN: (CANADA)

(416)444-6653

LEVEL ONE INFORMATION SHEET
APPLE //

1. Disk controller card:

Thirteen sector	Sixteen sector
P5 PROM (341-0009)	P5A PROM (341-0027 or 341-0127)
P6 PROM (341-0010) old style	P6A PROM (341-0028 or 341-0128)
P6A PROM (341-0028-01)	3.3 DOS
3.2 or 3.2.1 DOS	

The P6A PROM (341-0028) replaces the old P6 PROM (341-0010). The P6 PROM can no longer be ordered from Apple, but the (341-0028) works with both P5 and P5A PROM's.

The P6A PROM (341-0128) can be used with either the (341-0027) or (341-0009) PROM's.

2. Changing from 13 to 16 sector:

To change from 13 sector to 16 sector make sure the P6A PROM is a 341-0028, then change the 341-0009 to a 341-0027, but remember to give the customer a 3.3 Basic diskette, which can be ordered from Apple, so he can still run his 13 sector programs. Remember to explain about the MUFFIN program on the 3.3 MASTER diskette, which can also be ordered from Apple. The MUFFIN program allows some 13 sector programs to be changed to 16 sector.

3. Analog cards:

A. When a system is upgraded for 13 to 16 sector the customer may have trouble booting his 16 sector diskettes. Please refer to Service Bulletin 16 for information on this problem.

B. Optimum comparator offset timing delay is 2.9 to 3.0 uSec.

C. Old analog cards have only one adjustment pot.

4. Power Supplies:

There are three kinds of power supplies for A//'s. One is silver in color; the other two are gold colored. If you have to replace a silver p/s, use a gold p/s and Apple will send you a gold p/s in return. The silver p/s is no longer being produced or returned to dealers.

There are two kinds of gold colored power supplies in Apple //'s. One is non-RFI, the other is RFI. A non-RFI p/s cannot be used in a RFI APPLE but an RFI p/s can be used in a non-RFI APPLE. The way to tell the difference is to look at the serial number. If the power supply has a "T" stamped in front of the serial number it is always an RFI p/s. Also, a p/s that has a white sticker with the serial number stamped on it is RFI. Refer to Service Bulletin 49 for more information on identification of power supplies.

4. Power Supplies:

There are several different switches in use for power supplies, please refer to Service Bulletin 31 for information on this.

Service Bulletin 30 will give you important information on the operation of some of the older power supplies.

5. Motherboards:

A. There are two types of motherboards in Apple //'s and two versions of each, for the Apple //. There is Integer, RFI Integer, Applesoft and RFI Applesoft. Make sure you note on the RRT tag which kind of M/B returned to Apple.

Part Numbers

Integer	(661-91029)	RFI Integer	(661-91030)
Applesoft	(661-91031)	RFI Applesoft	(661-91032)

B. When returning an Apple // motherboard to Apple please remember:
1. Remove all RAM, if not M/B will be handled as a system
2. Return M/B with all ROM
3. Return M/B with all other chips installed. You will be billed for any missing chips even if the M/B is under warranty, and may also loose labor credit.
4. Don't stuff M/B with bad components.

C. Rev 0.... These motherboards are obsolete and are no longer made, so if you have to replace it, just put in any non-RFI M/B through Rev 7 and send the Rev 0 M/B to Apple as you would normally do. In return, Apple will send you a newer revision but not RFI M/B back as a replacement. If the Apple you replaced the Rev 0 M/B in is under Extended Warranty or Applecare then Apple honors the warranty, even thought the Rev 0 M/B is obsolete and no longer sent to the dealers in exchange.

D. Rev 1....Rev 7: These motherboards are slightly different in looks but work just the same and can be interchanged except for one item. The character generator, located at position A5 on the M/B, is the same for Rev 1...Rev 6 but different on the Rev 7. These two character generators are not interchange-able, but this difference is not important unless you change a M/B with a lower case adapter installed. Then the M/B used as the replacement must have a character generator with the same part number as the one being replaced.

Character Generator Part #

Rev 1...Rev 6 (335-2513)	Rev 7 (341-0036)

5. Motherboards:

E. If a customer has a M/B that special (non-Apple) modifications have been made to and it fails then this M/B should be handled as a special case. Call Technical Support and tell them what you have and work together to resolve the customer's problem. You may be given a SRA (Service Return Authorization) number to return the M/B on or be instructed to note on the RRT the name of the person you talked with. This gives the repair center someone to refer to when the motherboard arrives. You should also remember that non-Apple mods void the warranty.

F. RFI .. NON-RFI: Keep your RFI service stock separate from your non-RFI stock. A non-RFI M/B cannot be placed in a RFI Apple because 5 volts and ground have been changed on the RFI M/B's. If you do, the M/B and possible the p/s will be damaged and there is no warranty on this M/B. Also do not place an RFI M/B in a non-RFI Apple. To make sure the M/B you have is RFI, look at the chip just right of the processor (6502). If this chip has the number (8304) on it and the next socket and chip are missing altogether, the M/B is RFI.

6. Keyboards:

A. Old style: These keyboards have the electronics and the key switches on the same assembly. These are no longer made and have to be replaced with the newer two piece k/b. When you send the old style k/b to Apple, we will ship you a two piece K/B assembly. You will be charged $35.00 for the two modules and the suggested price to the customer is $65.00. If the Apple is under Extended Warranty or Applecare then there is no charge to the customer or the dealer for this exchange.

B. When unpacking remove any foam that may be used to pack a keyboard electric module. If this foam is not removed, the keyboard electric, will not function correctly.

C. Keycap Spacer Part #: 0 Degree...K815-0013 : 12 Degree...K815-0009

7. Disk Drives:

A. Do not send in a disk mechanical assembly with the customer's serialized base plate attached. If you do the assembly will be treated as a system.

B. If you send in a disk mechanical assembly without a base plate, you will be charged for a base plate ($15.00), Part # 805-0005, even if the assembly is under warranty. A mechanical assembly shipped without a base plate is vulnerable to subsequent damage, and may void the the warranty.

C. When you ship a disk mech. to Apple, just repack it as you received it. Put the white paper insert back in the drive, close and tape the door shut and secure the two cables. Place it back in shipping carton and return to Apple service.

APPLE //e

1. Logic boards for the //e must be returned to Apple with 64K of RAM on them. The one you receive from Apple will have 64K of RAM on them. If the RAM is missing you will be billed for it.

2. There are only a small number of chips for which a dealer will be reimbursed for replacing under warranty. These chips are shaded in on the //e chip map on the following page.

3. The keyboard for the //e is different and the keyswitches are also different. They cannot be interchanged with the keyswitches on an Apple //. The new keyswitch part number is (705-0070). Also these keyswitches do not use keycap spacers.

4. The //e only has 7 slots instead of 8 like the old Apple //. It does not need a Rom card or a Language card.

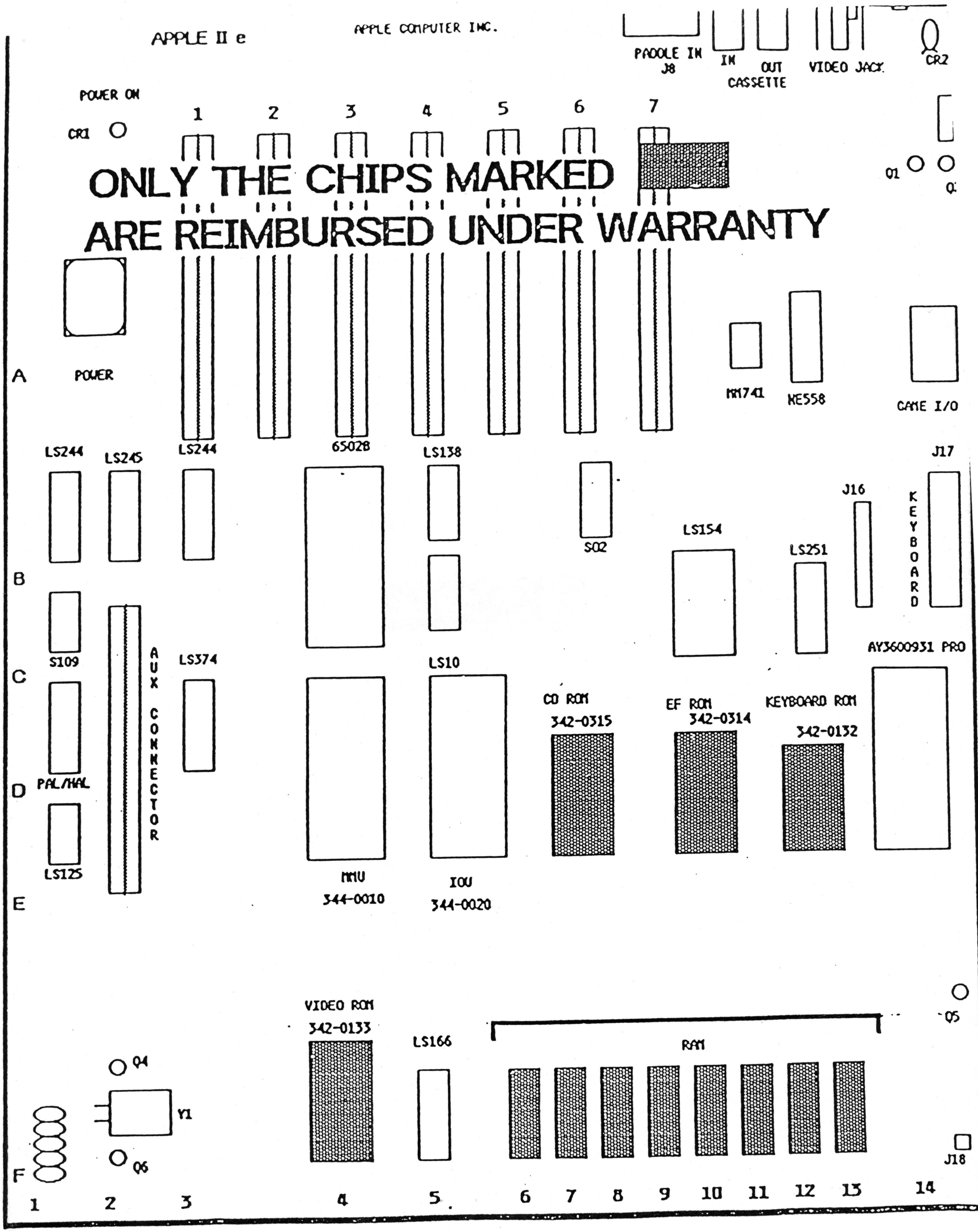
5. The power supply for the //e is the same as the RFI Apple //.

6. The disk drives and controller card that worked with an Apple // will work with an //e.

7. There is no way to check the RAM on the extended 80 column card at this time.

8. Keyboard must be installed before the system will boot.

9. When a //e M/B is returned to Apple, please place it in the anti-static bag in which it was originally shipped.


APPLE II e
APPLE COMPUTER INC.
PADDLE IN J8
IN
OUT
CASSETTE
VIDEO JACK
CR2
POWER ON
CR1
1
2
3
4
5
6
7
ONLY THE CHIPS MARKED
ARE REIMBURSED UNDER WARRANTY
Q1
POWER
MM741
NE558
GAME I/O
LS244
LS245
LS244
6502B
LS138
J17
J16
KEYBOARD
S02
LS154
LS251
S109
AUX CONNECTOR
LS374
LS10
AY3600931 PRO
CD ROM
342-0315
EF ROM
342-0314
KEYBOARD ROM
342-0132
PAL/HAL
LS125
MMU
344-0010
IOU
344-0020
VIDEO ROM
342-0133
LS166
RAM
Q5
Q4
Y1
Q6
J18
A
B
C
D
E
F
1
2
3
4
5
6
7
8
9
10
11
12
13
14

APPLE ///

1. Logic boards:

   A. There are two types of logic boards (motherboards) for the A ///, 5 volt and 12 volt. If you replace a logic board be sure you replace it with the same kind.

   The way to tell the difference is as follows,

12 volt	5 volt
C11...(341-0044)	C11...(341-0061)
C13...(341-0042)	C13...(342-0062) 128K (may not see)
	C13...(342-0063) 256K (order this one)

   12 volt.. R58 just to the right of C13 will be intact and you will have the ROM's listed under 12 volts above.

   5 volt.. R58 will be missing and the solder pad under what was R58 will be jumpered. Also you will have the ROM's listed under 5 volts above.

   B. When you replace a logic board be sure to check for and remove any foam attached to the back of the logic board. There will be no keyboard response if this foam is not removed.

   C. Running the internal RAM test (F6E6G) with a Profile Interface installed may cause the RAM test to fail. It is best to remove the Profile I/F or any other cards when running any diagnostics.

   D. 256K upgrade kits can be ordered through Customer Support
   PN# A3M0018

2. Memory boards:

   A. Two types:

   12 volt ... Has three rows of sockets for RAM
   Two rows....(334-0002) 16K RAM
   One row ....(333-0002) 32K RAM

   5 volt ... Has two rows of sockets for RAM
   One row...(334-0003) 64K RAM equals 128K
   Two rows..(334-0003) 64k RAM equals 256k

   5 volt is marked <u>5 Volt Memory Board</u> in the center of the memory board.

   B. The two memory boards are not interchangeable. Always remember that logic and memory boards of the same voltage must go together.

APPLE ///

1. Logic boards:

   A. There are two types of logic boards (motherboards) for the A ///, 5 volt and 12 volt. If you replace a logic board be sure you replace it with the same kind.

      The way to tell the difference is as follows,

12 volt	5 volt
C11...(341-0044)	C11...(341-0061)
C13...(341-0042)	C13...(342-0062) 128K (may not see)
	C13...(342-0063) 256K (order this one)

      12 volt.. R58 just to the right of C13 will be intact and you will have the ROM's listed under 12 volts above.

      5 volt.. R58 will be missing and the solder pad under what was R58 will be jumpered. Also you will have the ROM's listed under 5 volts above.

   B. When you replace a logic board be sure to check for and remove any foam attached to the back of the logic board. There will be no keyboard response if this foam is not removed.

   C. Running the internal RAM test (F6E6G) with a Profile Interface installed may cause the RAM test to fail. It is best to remove the Profile I/F when running any diagnostics.

   D. 256K upgrade kits can be ordered through Customer Support
      PN# A3M0018

2. Memory boards:

   A. Two types:

      12 volt ... Has three rows of sockets for RAM
      Two rows....(334-0002) 16K RAM
      One row ....(333-0002) 32K RAM

      5 volt ... Has two rows of sockets for RAM
      One row...(334-0003) 64K RAM equals 128K
      Two rows..(334-0003) 64k RAM equals 256k

      5 volt is marked <u>5 Volt Memory Board</u> in the center of the memory board.

   B. The two memory boards are not interchangeable. Always remember that logic and memory boards of the same voltage must go together.

3. Analog cards:

   A. Analog cards for the A /// internal and external drives are the same, but note on the RRT which one you are sending to Apple. There is different compensation for internal and external analog cards.

   B. Analog cards and disk mechanical assemblies for the A /// can be adjusted in Emulation Mode using the same methods and test points as an Apple // analog card.

   C. Recommended comparator offset timing delay is 2.9 to 3.0 uSec.

4. Disk Drives:

   A. The A/// spares kit does not contain an exchange mechanical assembly for the external drive, this must be ordered separately.
      External disk mech. PN# 661-92015

   B. Do not try to take one kind of A /// disk assembly, say an external, and try to make an internal drive by swapping the face plates. The castings are not identical and, therefore, not exchangeable.

   C. Here as with the Apple //, if the base plate is missing on a disk assembly when received, you will be charged. The price is the same as for the Apple //.

5. Keyboard:

   A. There are three different keyswitches on the Apple ///. Below is a list of the keyswitches and their part numbers.

      Alpha Lock 705-0004
      Reset 705-0009
      All others 705-0015

   B. If a customer brings in an A/// and says it comes up in internal RAM test when turned on, check the power on light in the keyboard. If the bulb is burned out the computer goes into the internal RAM test.

General Information

Warranty:

All modules received from Apple Service have a 90 day warranty from the time they are installed in a customer's system. If the module fails within the 90 time limit Apple will replace the module at no cost to the customer or the dealer. This only applies to the module that was replaced. It does not give another 90 warranty to the whole system.

Applecare:

If a customer wants Applecare for his Apple but it is out of the warranty period, a dealer can still write Applecare for the system. First, completely test the system to insure good working order, then complete the Applecare form as usual. A suggested price for checking the system is 1/2 hrs. labor plus any modules or parts replaced.

Warranty Invalidation:

Warranty can be invalidated for abuse, cannibalizing, failing to fill out the RRT correctly, loading a module with bad parts or not packing the module correctly for shipment to Apple. Also, non-Apple mods will invalidate the warranty. This applies to any module or system that is sent to Apple.

Systems:

If a system, under warranty, is sent to Apple for repair, the dealer will not receive warranty credit for the repair.

Diagnostics:

	Part Numners
Apple II	686-0005
Apple III	686-0007
Disk Calibration Kit ...	652-0289

Bell & Howell:

BLACK APPLES ... Apple does not honor the warranty for any BLACK APPLE sold by Bell & Howell. Warranty support for these systems must be supplied by Bell & Howell.

APPLE //e ... We now contract with Bell & Howell for the white //e. If a //e is brought into your store and it was purchased somewhere else, Apple will honor the warranty.

Numeric Keypads:

Kits are available for the Apple // numeric keypads and may be ordered from the Service Department. PN# 652-0519

General Information

Non-repairable items:

Graphic tablet pens, joysticks and game paddles are not repaired by Apple. It cost more to repair them than to replace them. If the customer wants a joystick or game paddle repaired, a dealer may repair them or persuade the customer to buy new ones. Apple does not stock kits or parts for these items. Any parts will have to come from local sources.

If the item is under warranty, it will be replaced at no cost to the dealer or the customer. Apple handles these items as any other item under warranty. Just report it on the DRP or SRO that is sent to Apple.

DMP & DWP Printers:

IF these printers are used without paper inserted the platen will become hard and slick. This will cause the paper not to feed correctly when using friction feed.

Monitor ///:

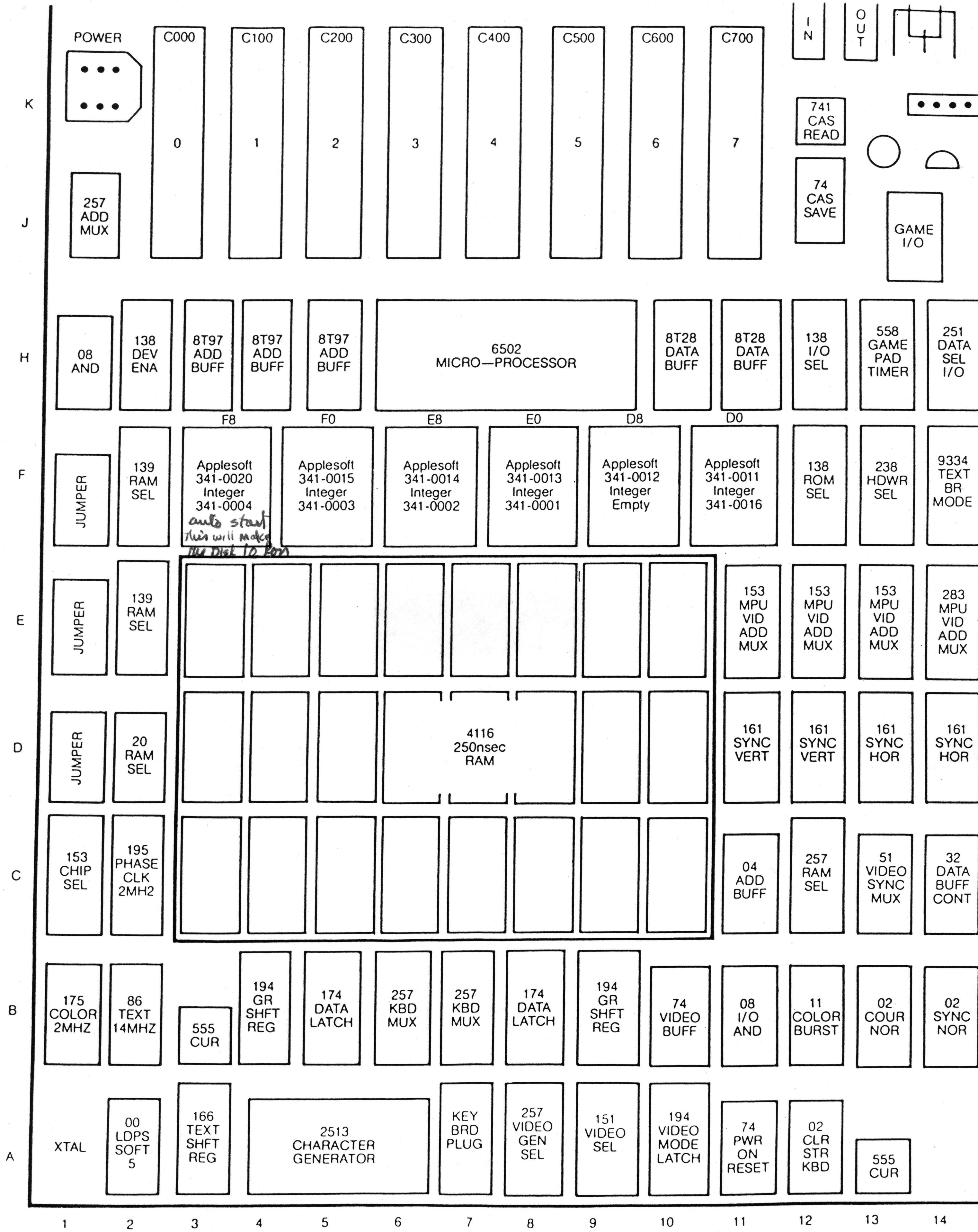
Before sending a Monitor /// to Apple for service check the following adjustments; Vertical hold, Vertical size and Brightness. Several monitors have come in for service and all that had to be done was to turn up the brightness.

Service Return Authorizations (SRA's):

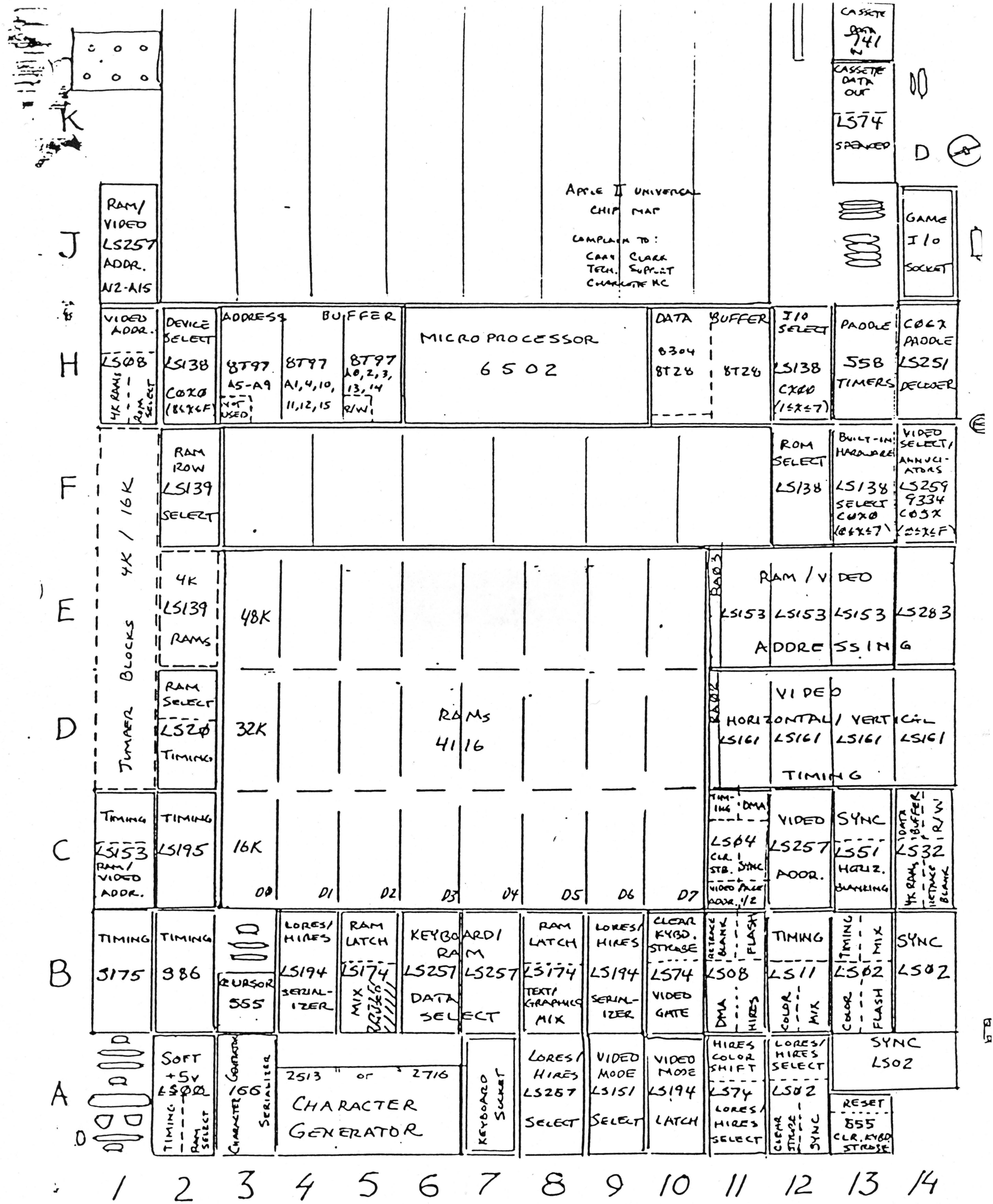
SRA's are initiated by Regional Technical Support. Should a module need special attention beyond the normal exchange or repair and return policies Tech. Support will log the module by the RRT number before you send it in and give you the SRA number to put on the RRT. This is rarely used but is available for repairs with extenuating circumstances.

R/F Modulators:

Astec sells R/F modulators to anyone (dealer or end-user) for $36.00 each. This is the last price we had form them. The contact person at Astec is Linda Walde. The telephone number is (1-408-727-3350).



POWER
C000
C100
C200
C300
C400
C500
C600
C700
0
1
2
3
4
5
6
7
IN
OUT
K
741 CAS READ
74 CAS SAVE
J
257 ADD MUX
GAME I/O
H
08 AND
138 DEV ENA
8T97 ADD BUFF
8T97 ADD BUFF
8T97 ADD BUFF
6502 MICRO—PROCESSOR
8T28 DATA BUFF
8T28 DATA BUFF
138 I/O SEL
558 GAME PAD TIMER
251 DATA SEL I/O
F8
F0
E8
E0
D8
D0
F
JUMPER
139 RAM SEL
Applesoft 341-0020 Integer 341-0004
auto start
this will make
Applesoft 341-0015 Integer 341-0003
Applesoft 341-0014 Integer 341-0002
Applesoft 341-0013 Integer 341-0001
Applesoft 341-0012 Integer Empty
Applesoft 341-0011 Integer 341-0016
138 ROM SEL
238 HDWR SEL
9334 TEXT BR MODE
E
JUMPER
139 RAM SEL
153 MPU VID ADD MUX
153 MPU VID ADD MUX
153 MPU VID ADD MUX
283 MPU VID ADD MUX
D
JUMPER
20 RAM SEL
4116 250nsec RAM
161 SYNC VERT
161 SYNC VERT
161 SYNC HOR
161 SYNC HOR
C
153 CHIP SEL
195 PHASE CLK 2MH2
04 ADD BUFF
257 RAM SEL
51 VIDEO SYNC MUX
32 DATA BUFF CONT
B
175 COLOR 2MHZ
86 TEXT 14MHZ
555 CUR
194 GR SHFT REG
174 DATA LATCH
257 KBD MUX
257 KBD MUX
174 DATA LATCH
194 GR SHFT REG
74 VIDEO BUFF
08 I/O AND
11 COLOR BURST
02 COUR NOR
02 SYNC NOR
A
XTAL
00 LDPS SOFT 5
166 TEXT SHFT REG
2513 CHARACTER GENERATOR
KEY BRD PLUG
257 VIDEO GEN SEL
151 VIDEO SEL
194 VIDEO MODE LATCH
74 PWR ON RESET
02 CLR STR KBD
555 CUR
1 2 3 4 5 6 7 8 9 10 11 12 13 14


APPLE II UNIVERSAL CHIP MAP
COMPLAINTS TO: CARY CLARK TECH. SUPPORT CHARLOTTE NC
CASSETTE DATA 741 IN
CASSETTE DATA OUT LS74 SPEAKER
GAME I/O SOCKET
RAM/VIDEO LS257 ADDR. A12-A15
VIDEO ADDR. LS08 4K RAMS ROM SELECT
DEVICE SELECT LS138 C0X0 (8≤X≤F)
ADDRESS BUFFER 8T97 A5-A9 NOT USED 8T97 A1,4,10,11,12,15 8T97 A0,2,3,13,14 R/W
MICROPROCESSOR 6502
DATA BUFFER 8304 8T28 8T28
I/O SELECT LS138 CX00 (1≤X≤7)
PADDLE 558 TIMERS
C06X PADDLE LS251 DECODER
RAM ROW LS139 SELECT
ROM SELECT LS138
BUILT-IN HARDWARE LS138 SELECT C0X0 (0≤X≤7)
VIDEO SELECT/ANNUNCIATORS LS259 9334 C05X (8≤X≤F)
JUMPER BLOCKS 4K / 16K
4K LS139 RAMS
48K 32K 16K
RAMS 4116
D0 D1 D2 D3 D4 D5 D6 D7
RAM/VIDEO ADDRESSING LS153 LS153 LS153 LS283
VIDEO HORIZONTAL/VERTICAL TIMING LS161 LS161 LS161 LS161
RAM SELECT LS20 TIMING
TIMING LS153 RAM/VIDEO ADDR.
TIMING LS195
TIMING DMA LS04 CLR. STB. SYNC VIDEO PAGE ADDR. 1/2
VIDEO LS257 ADDR.
SYNC LS51 HORIZ. BLANKING
DATA BUFFER R/W LS32 4K RAMS RETRACE BLANK
TIMING S175
TIMING S86
CURSOR 555
LORES/HIRES LS194 SERIALIZER
RAM LATCH LS174 MIX
KEYBOARD/RAM LS257 LS257 DATA SELECT
RAM LATCH LS174 TEXT/GRAPHICS MIX
LORES/HIRES LS194 SERIALIZER
CLEAR KYBD. STROBE LS74 VIDEO GATE
RETRACE BLANK FLASH LS08 DMA HIRES
TIMING LS11 COLOR MIX
TIMING MIX LS02 COLOR FLASH
SYNC LS02
SOFT +5V LS00 TIMING RAM SELECT
CHARACTER GENERATOR 166 SERIALIZER
2513 or 2716 CHARACTER GENERATOR
KEYBOARD SOCKET
LORES/HIRES LS257 SELECT
VIDEO MODE LS151 SELECT
VIDEO MODE LS194 LATCH
HIRES COLOR SHIFT LS74 LORES/HIRES SELECT
LORES/HIRES SELECT LS02 CLEAR STROBE SYNC
SYNC LS02
RESET 555 CLR. KYBD STROBE
A B C D E F H J K
1 2 3 4 5 6 7 8 9 10 11 12 13 14

REVISED September 9, 1983

REQUIRED SPARES KIT MATRIX

The matrix below summarizes the required spares kits currently available or soon to be introduced by Apple. The prices shown are dealer cost.

To get kits marked by "X" order:

	APPLE][ ][+ RFI	APPLE //e	APPLE ///	SILENTYPE	PROFILE	DAISY WHEEL	DOT MATRIX	NUMERIC KEYPAD	LISA	MONITOR ///	MONITOR II	GRAPH TAB RFI	COLOR PLOTTER	
652-0141	X	.	.	.	.	.	.	.	.	.	.	.	.	$1,383.
652-0505	.	X	.	.	.	.	.	.	.	.	.	.	.	$ 669.
652-0321	.	.	X	.	.	.	.	.	.	.	.	.	.	$1,083.
652-0110	.	.	.	X	.	.	.	.	.	.	.	.	.	$ 93.
652-0526	.	.	.	.	X	.	.	.	.	.	.	.	.	$1,539.
652-0508	.	.	.	.	.	X	.	.	.	.	.	.	.	$1,680.
652-0509	.	.	.	.	.	.	X	.	.	.	.	.	.	$ 444.
652-0519	.	.	.	.	.	.	.	X	.	.	.	.	.	$ 57.
652-0520	.	.	.	.	.	.	.	.	X	.	.	.	.	$4,551.
652-0467	.	.	.	.	.	.	.	.	.	X	.	.	.	$ 168.
652-0533	.	.	.	.	.	.	.	.	.	.	X	.	.	$ 120.
652-0530	.	.	.	.	.	.	.	.	.	.	.	X	.	$ 255.
652-0538	.	.	.	.	.	.	.	.	.	.	.	.	X	$ 462.

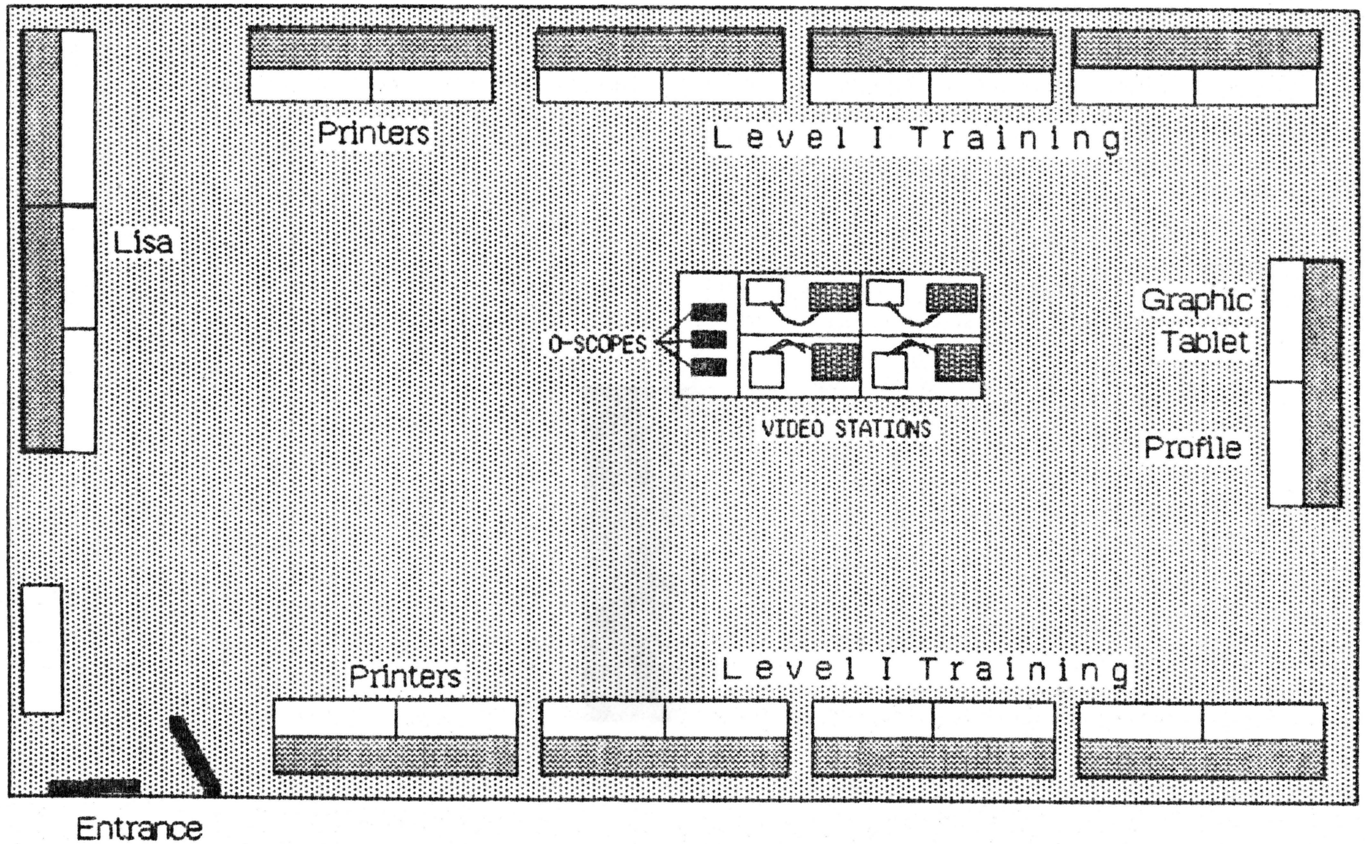
REVISED September 9, 1983

OPTIONAL SPARES KIT MATRIX

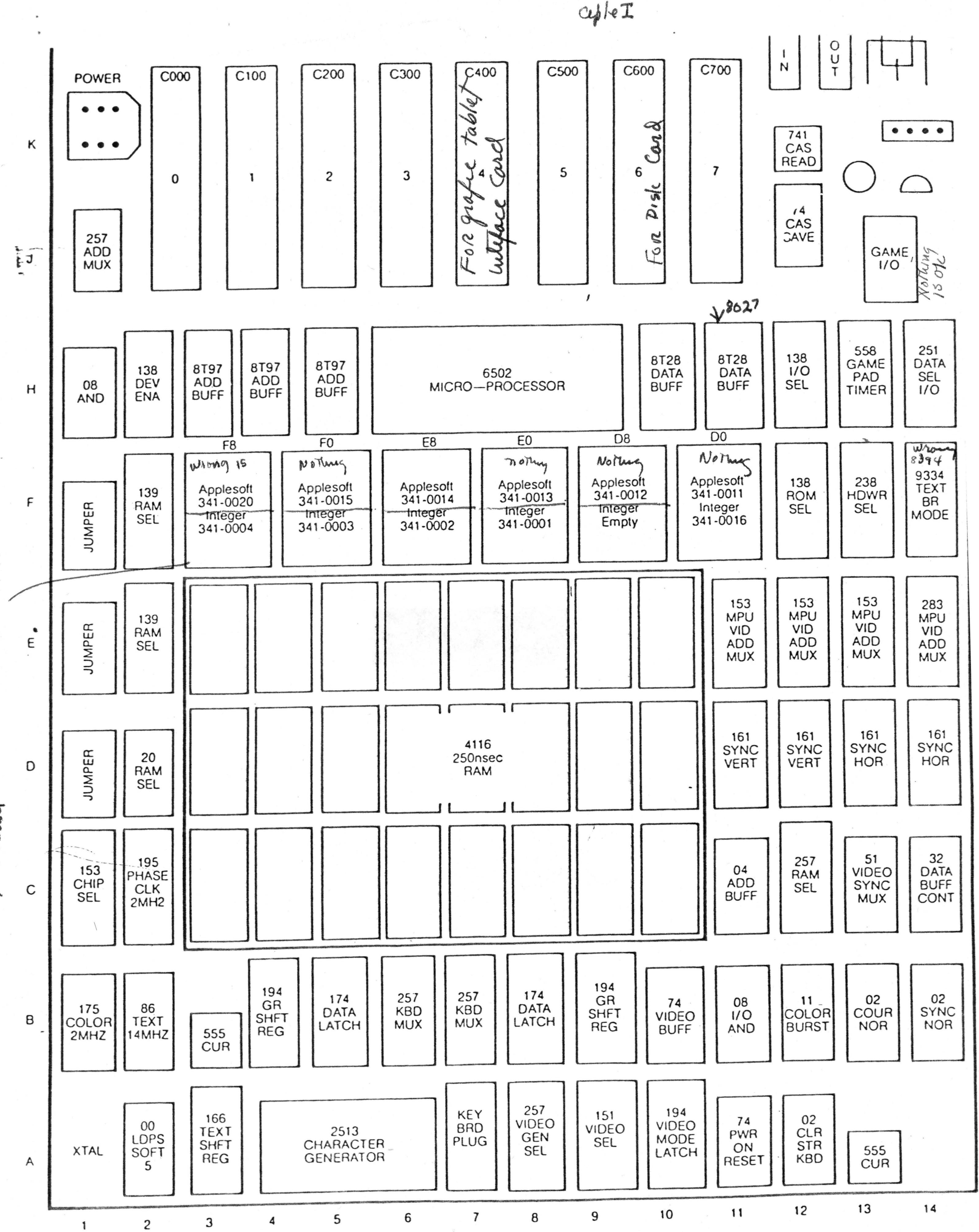
The matrix below summarizes the optional spares kits currently available from Apple. The prices listed are dealer cost.

To get kits marked by "X" order:

	DISK CALIBRATION	APPLE][HDWE	APPLE //e HDWE	APPLE /// HDWE	APPLE][IC	APPLE //e IC	APPLE /// IC	
652-0289	X	.	.	.	.	.	.	$ 168.
652-0501	.	X	.	.	.	.	.	$ 84.
652-0507	.	.	X	.	.	.	.	$ 39.
652-0502	.	.	.	X	.	.	.	$ 90.
652-0503	.	.	.	.	X	.	.	$ 147.
652-0506	.	.	.	.	.	X	.	$ 120.
652-0504	.	.	.	.	.	.	X	$ 198.

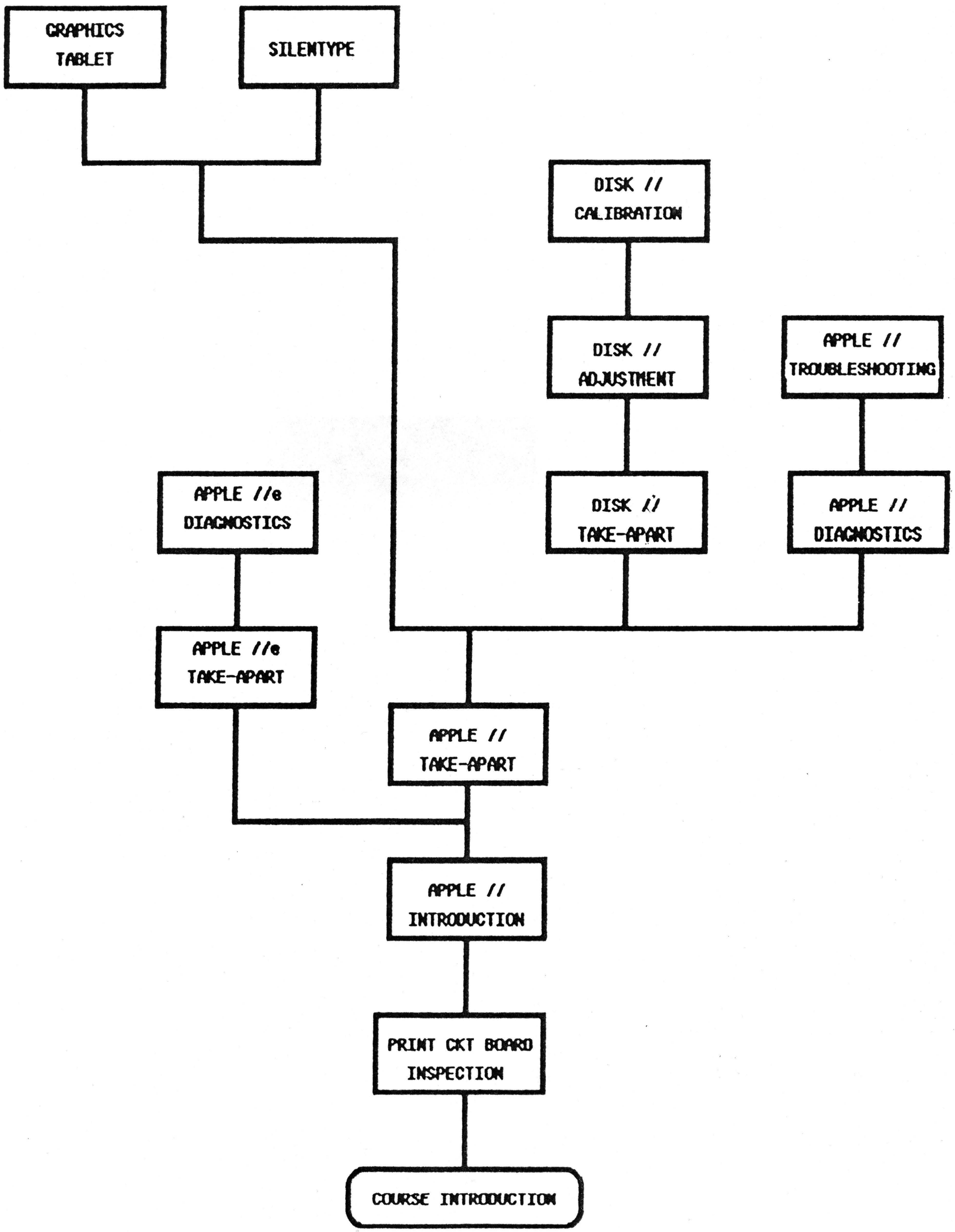


Level I Service Training Room
Charlotte, North Carolina



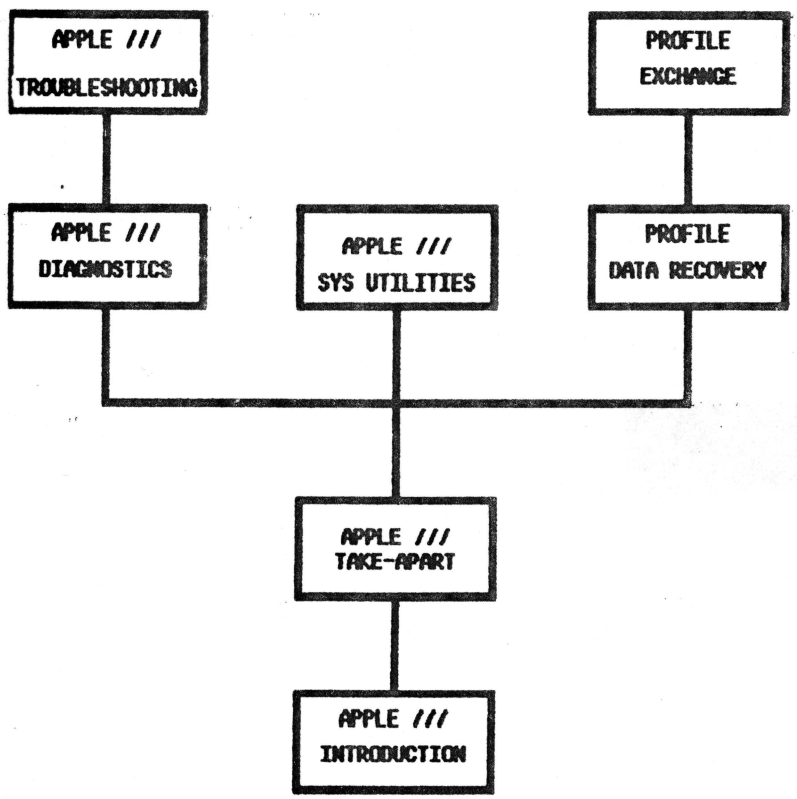
POWER
C000
0
C100
1
C200
2
C300
3
C400
4
For grafic tablet interface Card
C500
5
C600
6
For Disk Card
C700
7
IN
OUT
741 CAS READ
74 CAS SAVE
GAME I/O
Nothing 13 OK
257 ADD MUX
K
J
H
F
E
D
C
B
A
08 AND
138 DEV ENA
8T97 ADD BUFF
8T97 ADD BUFF
8T97 ADD BUFF
6502 MICRO—PROCESSOR
8T28 DATA BUFF
8027
8T28 DATA BUFF
138 I/O SEL
558 GAME PAD TIMER
251 DATA SEL I/O
F8
F0
E8
E0
D8
D0
JUMPER
139 RAM SEL
Wrong 15
Applesoft 341-0020 Integer 341-0004
Nothing
Applesoft 341-0015 Integer 341-0003
Applesoft 341-0014 Integer 341-0002
Nothing
Applesoft 341-0013 Integer 341-0001
Nothing
Applesoft 341-0012 Integer Empty
Nothing
Applesoft 341-0011 Integer 341-0016
138 ROM SEL
238 HDWR SEL
Wrong 8394
9334 TEXT BR MODE
JUMPER
139 RAM SEL
153 MPU VID ADD MUX
153 MPU VID ADD MUX
153 MPU VID ADD MUX
283 MPU VID ADD MUX
JUMPER
20 RAM SEL
4116 250nsec RAM
161 SYNC VERT
161 SYNC VERT
161 SYNC HOR
161 SYNC HOR
153 CHIP SEL
195 PHASE CLK 2MH2
04 ADD BUFF
257 RAM SEL
51 VIDEO SYNC MUX
32 DATA BUFF CONT
1S either number's Top or bottom
175 COLOR 2MHZ
86 TEXT 14MHZ
555 CUR
194 GR SHFT REG
174 DATA LATCH
257 KBD MUX
257 KBD MUX
174 DATA LATCH
194 GR SHFT REG
74 VIDEO BUFF
08 I/O AND
11 COLOR BURST
02 COUR NOR
02 SYNC NOR
XTAL
00 LDPS SOFT 5
166 TEXT SHFT REG
2513 CHARACTER GENERATOR
KEY BRD PLUG
257 VIDEO GEN SEL
151 VIDEO SEL
194 VIDEO MODE LATCH
74 PWR ON RESET
02 CLR STR KBD
555 CUR
1
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APPLE // FAMILY

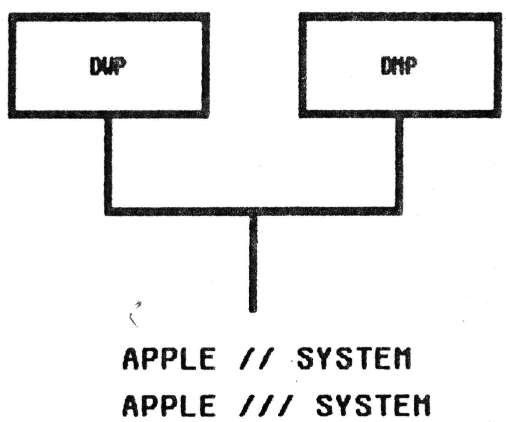


8/83
NST

APPLE /// FAMILY



PRINTERS



8/83
NST

AppleCare

Carry-In Service Plan

Agreement No. 0180229

Authorized Apple Dealer: Please complete this Registration Form (please print legibly) and return the Apple copy to your Apple Regional Support Center. Attn: AppleCare. Each System Service plan must cover one Apple Personal Computer. Peripherals can be added to existing coverage by pro-rating (months only) on a new Registration Form.

Customer:

Customer/Company ____________________

Attn: ____________________

Address ____________________

City ____________________

State/Zip ____________________

Authorized Apple Dealer:

Name ____________________

Address ____________________

City ____________________

State/Zip ____________________

Dealer No. ____________________

Expiration Date ____-____-____

Equipment Purchase Date ____-____-____

Check One: ☐ System Coverage
☐ Add-On Coverage to Original

Agreement No. ____________________

Equipment Covered By This Agreement:

Product Description	Serial Number	AppleCare No.	No. of * Months	Price	Total
		SC___00___			
		SC___00___			
		SC___00___			
		SC___00___			
		SC___00___			
		SC___00___			
		SC___00___			
		SC___00___			
		SC___00___			
		SC___00___			

* 12 MONTHS EXCEPT FOR ADD-ON AGREEMENTS

Subtotal	
Sales Tax (If Applicable)	
Total	

Apple Owner: The terms and conditions of this agreement are stated on the reverse side. **Verification of your AppleCare coverage will be sent to you from Apple within 6 weeks.**

By signing this agreement, you acknowledge that you have read, understand, and agree to be bound by its terms and conditions. Further, you agree that it is the complete statement of the agreement between you and Apple which supersedes all others, oral or written, relating to the subject matter of this agreement.

Customer Signature ____________________ Date ________

Dealer Signature ____________________ Date ________

Profile -

APPLE COMPUTER
CHARLOTTE SERVICE DEPARTMENT

TELEPHONE INFORMATION

LEVEL I TRAINING	(704) 525-8120 x 180	Sandy Furlong Scot Treadwell*
SERVICE ADMINISTRATION Invoices Status on Parts Orders Repairs in Progress	(704) 525-8120 x 122 123 ? Invoicing Parts OR Stock	Dot Gary Debbie Payne
APPLECARE	(704) 525-8120 x 124	Susan VanReen
DEALER TECHICAL SUPPORT	Dealer Phone # not user (704) 527-4810	Barry Byrum Bill Starnes Paul Olson Gary Houser Grover Nunnery

The Dealer Technical Support telephone line is for the exclusive use of the authorized Level I Service Center. We ask in order to provide you with the best possible reponse, you do not give this number to end-users. Hours 9:00 AM to 5:00 PM.

END-USER TECHNICAL SUPPORT	(704) 527-6170	Staff

The Dealer should assist the end-user with all technical and service questions. If a Dealer has used all possible resources and can not resolve the problem, the end-user may call this telephone line. Hours 9:00 AM to 5:00 PM.

CUSTOMER SUPPORT	(800) 532-6769 NC only (800) 438-5068	Staff

Finished goods orders, missing parts from these orders or shipping questions should be directed to this group. Hours 8:00 AM to 5:00 PM.

1/5/84
NST

Apple II

apple computer inc.

APPLE][TECHNICAL PROCEDURES

TABLE OF CONTENTS

apple computer inc.

Apple][Technical Procedures

Section 1

Take-apart

Contents:

NOTE: These procedures apply to the 150,000 or so pre-EMI Apple]['s. Because of successive revisions of the Apple][design, you may notice slight differences in the configuration of screws and bolts on particular machines you work with. These differences will not significantly alter the procedures.

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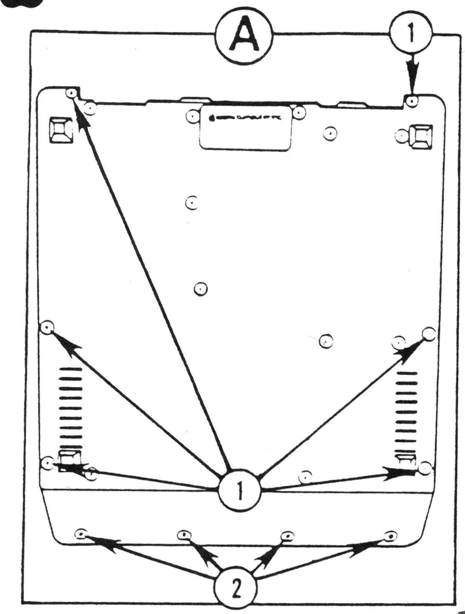


FIGURE A

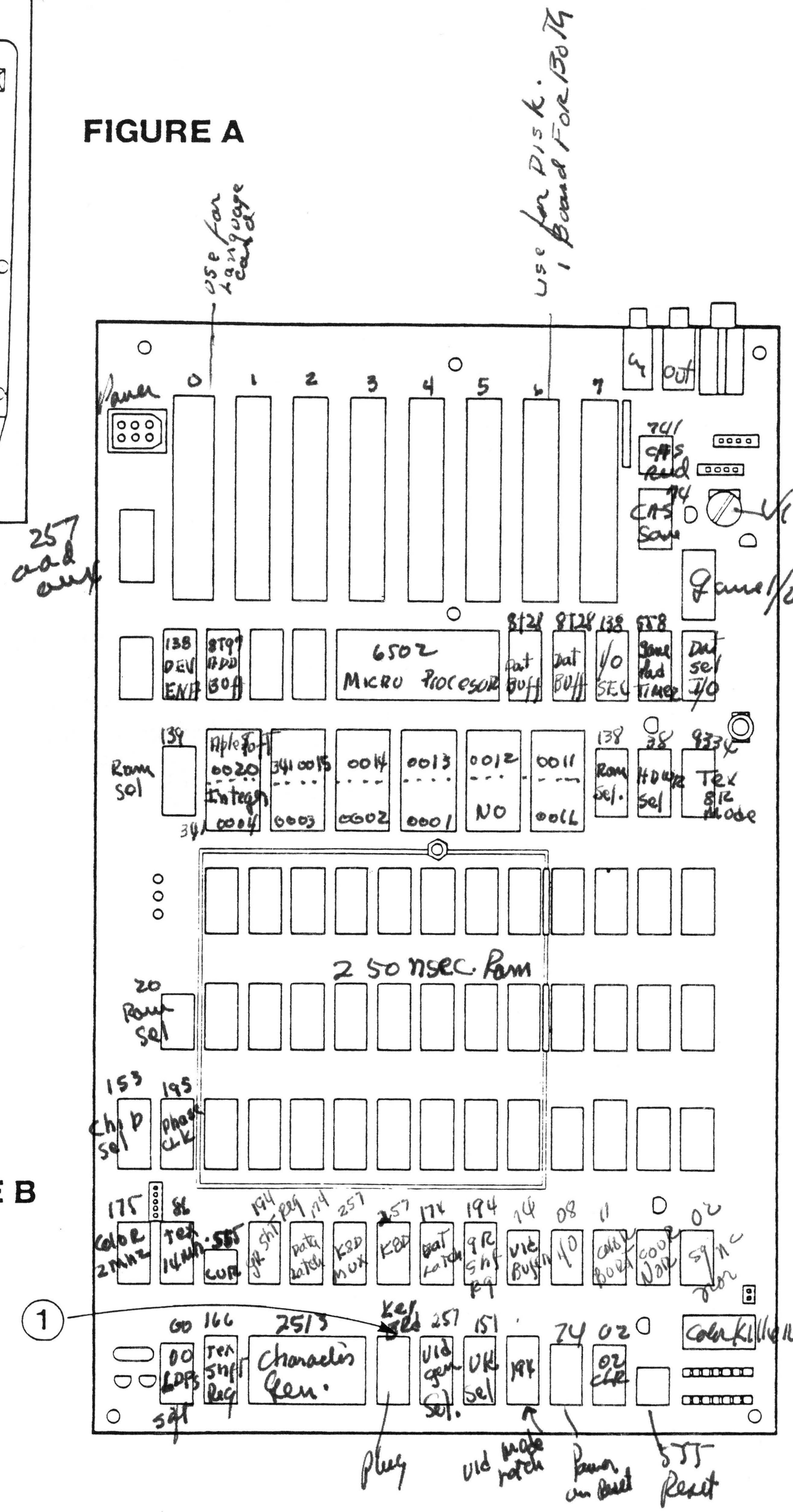


FIGURE B

A. OPENING THE CASE

1. Power down; disconnect the power cord and video cable.

2. Remove Apple lid.

3. TOUCH THE POWER SUPPLY TO REMOVE ANY STATIC CHARGE YOU MAY BE CARRYING. Then remove all peripheral cables and cards .

4. Turn the Apple upside down, resting the keyboard on a protective pad.

5. Remove the six flat-head screws from the three outside edges of flat portion of Apple base (see Figure A, #1).

6. Remove the four round-head screws and lock washers from the front of the base (see Figure A, #2).

7. Grasping both base and housing, turn the Apple right side up.

8. Gently lift the front of the housing slightly off the base and unplug the keyboard connector from the front of the motherboard (see Figure B, #1).

   NOTE: If the keyboard connector is difficult to remove, use the IC puller.

9. Lift housing off base and set aside.

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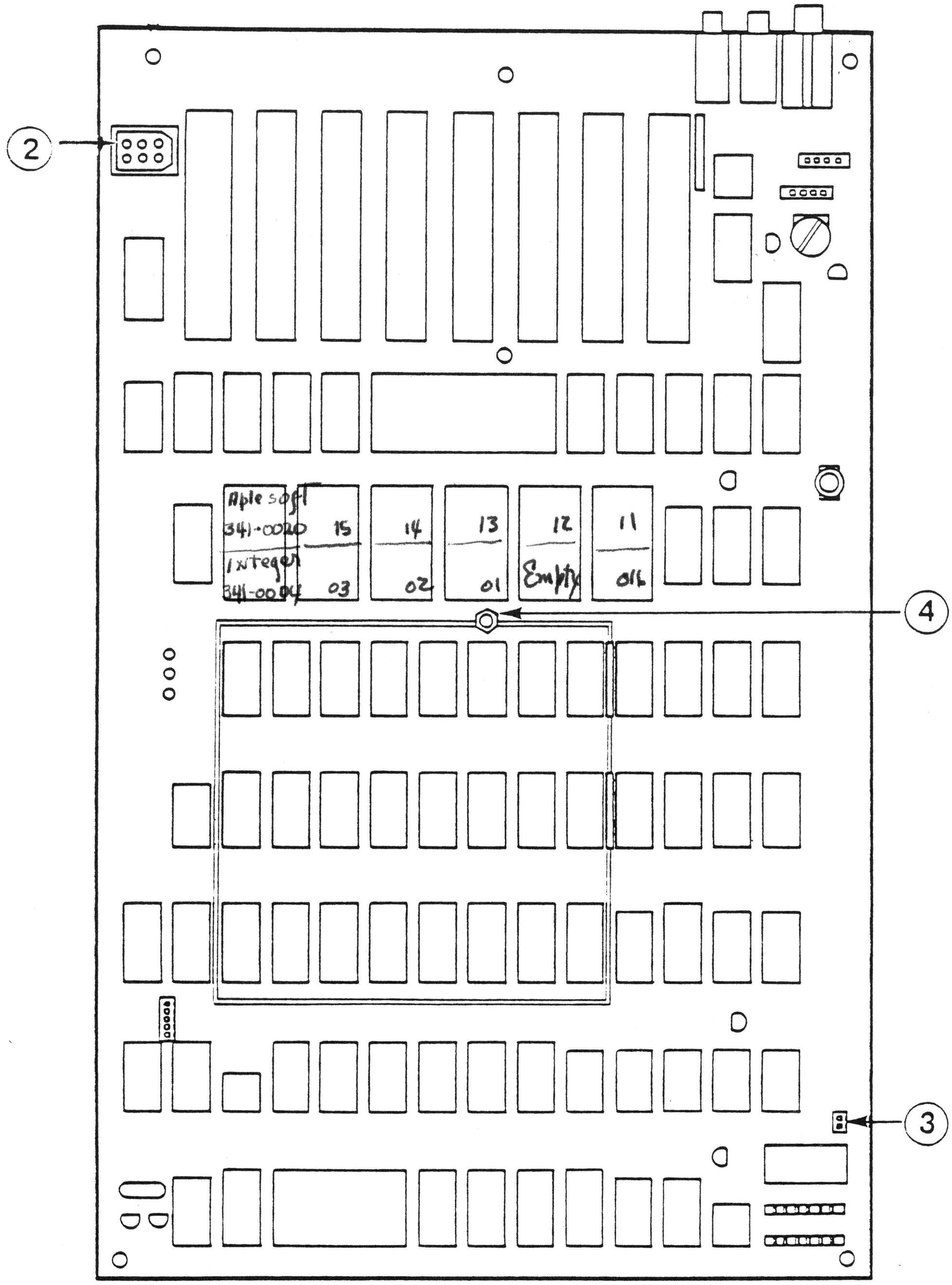


FIGURE B

B. REMOVING THE MOTHERBOARD

1. Power off. Follow procedures for opening the case (section A above, p.1.3).

2. Pinch the front and rear sides of the power supply plug and pull the plug from the top of the motherboard (see Figure B, #2).

3. Unplug the speaker connector (see Figure B, #3).

4. Using a nutdriver, remove the 5/16" nut and lockwasher in the middle of the motherboard (see Figure B, #4).

5. Using a flatblade screwdriver or needlenose pliers, push in on the flanges of the six stand-offs: one in each corner and two between slots 4 & 5.

6. Carefully lift the board up and out.

REPLACING THE MOTHERBOARD

1. Place the motherboard into position over the four stand-offs at the corners of the board and the two between slots 4 and 5, and press board down into place.

2. Install washer and nut in the middle of the board and tighten just until snug.

3. Plug in speaker connector.

4. Plug in power supply.

5. Place housing over base.

6. Lift the front of the housing slightly and reinstall the keyboard connector. (Be sure pin 1 of the connector plug aligns with pin 1 of the socket.)

7. Grasping both base and housing, turn Apple upside down.

8. Make sure bent tab at back of base fits into slot in housing, then install lock washers and four round-head screws in front of base.

9. Install six flat-head screws in the three outside edges of base.

10. Turn the Apple rightside up.

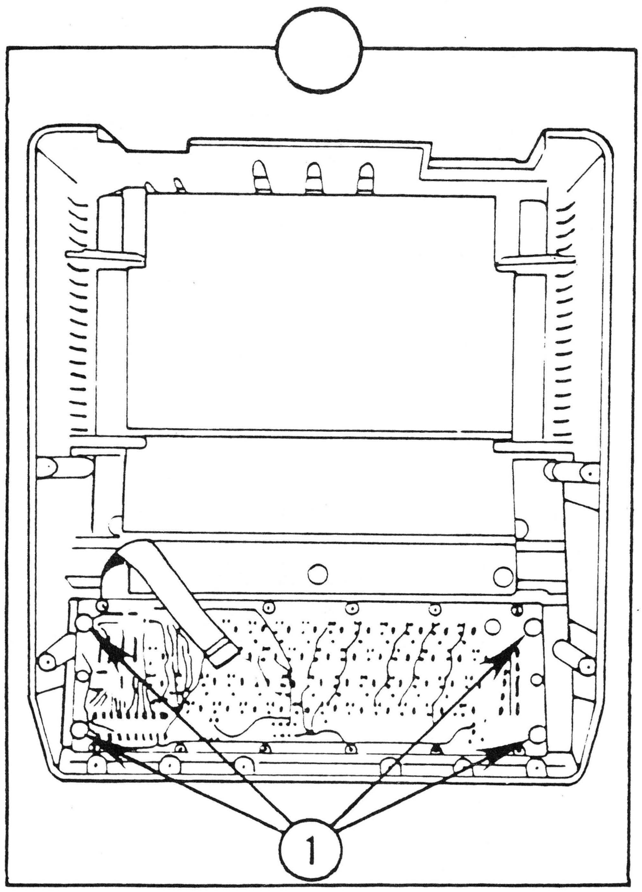


FIGURE C

C. REMOVING THE KEYBOARD

1. Follow procedures for opening the case (section A, p.1.3).

2. Turn Apple housing upside down so the keyboard rests on protective pad.

3. Remove the four nuts and lock washers (or screws) holding the keyboard to the housing (see Figure C).

4. Lift the keyboard free.

REPLACING THE KEYBOARD

1. Put the keyboard back in place.

2. Replace the nuts and lockwashers (or screws) which hold the keyboard to the Apple housing.

3. Turn the housing rightside up and place it over the base.

4. Lift the front of the housing slightly and plug the keyboard connector into its socket in row A of the motherboard. (Be sure pin 1 of the connector plug aligns with pin 1 of the socket.)

5. Grasping both base and housing, turn Apple upside down.

6. Make sure bent tab at back of base fits into slot in housing, then install lock washers and four round-head screws in front of base.

7. Install six flat-head screws in the three outside edges of base.

8. Turn the Apple rightside up.

D. **REPLACING THE POWER LIGHT**

1. Pry off the power light cap.

2. Lift off shift key cap.

3. If the light has a full shield, pry it off. (If it's a half shield, don't try to remove it.)

4. Lift out bulb, using fingers (if they're small enough) or needlenose pliers.

5. Replace bulb, making sure to put both wires into the small sockets.

6. Replace plastic shield.

7. Replace shift key cap and power light cap.

Apple][Technical Procedures

Section 2

Diagnostics

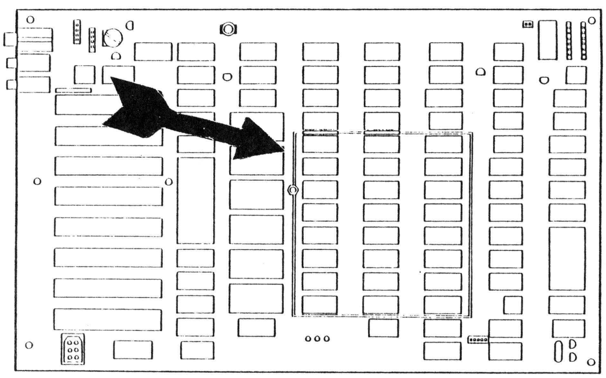
Contents:

apple computer inc.

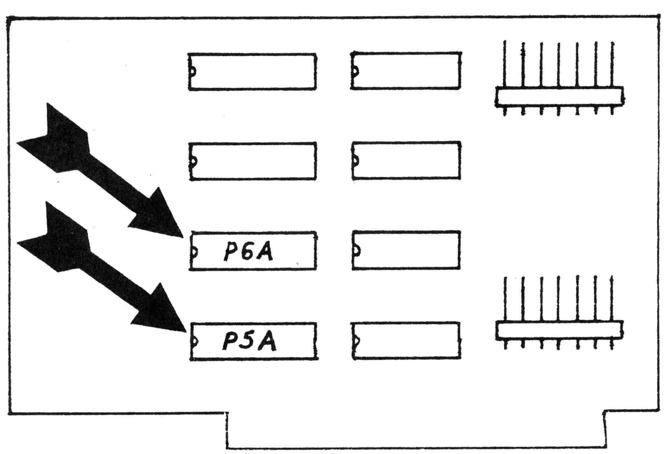
A. GETTING STARTED

The Apple][Product Diagnostics diskette contains a series of tests designed to help you troubleshoot system problems and make adjustments to some commonly used Apple peripherals. The job-aids in this package provide brief descriptions of the function of each test, and guidelines on when and how to use them.

Before you can use the Product Diagnostics, you must have 48K of memory in the system (all of the memory sockets on the motherboard must have memory ICs installed in them).



You must also have the P5A (341-0027) and P6A (341-0028) PROMs installed on the Disk Interface card in slot 6.



B. TROUBLESHOOTING CHART

This chart is designed to help you decide which test to use for most common problems. Just find the type of complaint that the customer has in the first column, then use the test listed in the second column.

Complaint	Test
Flaky system	Motherboard RAM (p. 4)
Can't use some BASIC programs (motherboard BASIC)	Motherboard ROM (p. 5)
Can't use some BASIC programs (firmware card BASIC)	Applesoft/Integer ROM card (p. 13)
Can't use some programs (language card language)	Language card (p. 14)
Can't use some programs (not language related)	Motherboard RAM (p. 4)
ROM Utilities won't work	Programmer's Aid #1 (p. 6)
Missing characters	Keyboard (p. 7)
Can't select menu items	Keyboard (p. 7)
Paddle/Button problems	Game Paddle/Button (p. 8)
Tape problems	Tape Read/Write/Verify (p. 9)
Display problems	Color Bar (p. 10) Motherboard RAM (p. 4)
Graphics Tablet problems	Graphics Tablet (p. 12)
Disk problems	Disk I/F card (p. 16)
Parallel printer problems	Printer card (p. 18)
Serial Printer problems	Serial/Communications card (p. 20)
Silentype problems	Silentype test (p. 22)
Modem problems	Serial/Communications card (p. 20)

C. MOTHERBOARD RAM TEST

You would use this test if the customer told you that his system acted "flaky" or wouldn't run certain programs (after you try a known good copy of the suspect program to eliminate the possibility of a software problem). The CONTINUOUS TEST option is useful for finding intermittent problems, and for "burning-in" a system (running it for a while to make sure that it won't fail half an hour after the customer gets it home).

This diagnostic tests each RAM (Random Access Memory) IC on the motherboard. It also checks the RAM at location E2 on the Language Card if that card is installed. During the test, the disk drive is activated to cause electrical noise and put a heavy load on the power supply. These conditions make it more likely that marginal RAMs will fail the test.

To run the test:

1) Boot the Apple][Product Diagnostics diskette.

2) Use the <ESC> key to move the cursor to the MOTHERBOARD RAM TEST line on the main menu, then press <RETURN>.

3) When the title screen appears, you are given a choice of running the test or returning to the main menu (just in case you made a mistake). Press <RETURN> to run the test.

The test will run with no more inputs from you. First you will see a screen full of inverse "@"s, followed by a screen full of normal "?"s. Each of those screens lasts about 30 seconds, and some flickering during the first few seconds of each screen is normal. After these screens, you will see a screen of garbage (you'll know it when you see it), that will change a few times. When the test is over, the results screen will be displayed. This screen is self-explanatory. At the bottom of the screen is a mini-menu that works with the <ESC> and RETURN keys in the same fashion as the main menu.

4) If you want to run the memory test for an extended period, select CONTINOUS TEST and press <RETURN>. The memory test will then cycle until you press <ESC>, which will take you back to the results screen.

If any bad ICs are indicated, replace them and run the test again.

D. MOTHERBOARD ROM TEST

You would use this test if the customer said that his system had problems running some or all BASIC programs.

This test checks each ROM (Read Only Memory) in the INTEGER or APPLESOFT set on the motherboard, whichever is present.

To run the test:

1) Boot the Apple][Product Diagnostics diskette.

2) Use the <ESC> key to move the cursor to the MOTHERBOARD ROM TEST line on the main menu, then press <RETURN>.

NOTE: This test MUST be observed during operation as it does not "keep records" and report its results as the RAM test does.

The test will run with no more inputs from you. As each ROM is tested the program will display the name of the ROM. After testing, it will report either "NO ERRORS FOUND" (for a good ROM) or "CAN'T MATCH CODE" (for a bad one); then it will go on to the next ROM. When all of the ROMs have been tested, it will return to the main menu.

If one of the ROMs fails, replace it and run the test again.

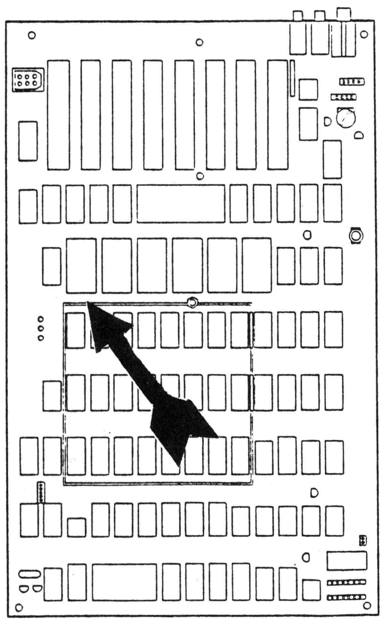
E. PROGRAMMER'S AID #1 TEST

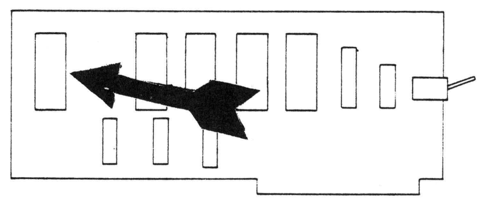
You would use this test if the customer complains that any or all of the functions supported by the Programmer's Aid #1 ROM aren't working correctly. (See the Programmer's Aid #1 manual for a list.)

The test checks the Programmer's Aid #1 utility ROM.

To run the test:

1) Install the Programmer's Aid #1 ROM (341-0016) at the D0 position on the motherboard (location F11) if you have an Apple][, or the INTEGER ROM card (location A1) if you have an Apple][+.





2) Boot the Apple][Product Diagnostics diskette.

3) Use the <ESC> key to move the cursor to the PROGRAMMER'S AID #1 TEST line on the main menu, then press <RETURN>.

NOTE: This test MUST be observed in operation, as it does not "keep records" and report its results as the RAM test does.

The test will run with no further inputs from you. The message "NO ERRORS ENCOUNTERED" will be displayed if the ROM is good, otherwise the message "UNABLE TO MATCH CODE" will appear. The program will then return to the main menu.

If the ROM fails, replace it and run the test again.

F. KEYBOARD TEST

You would use this test if the customer complains about missing characters when entering data/commands/text or not being able to select functions (like menu items) when using programs.

This test checks (actually, it allows you to check) each key on the keyboard, the keyboard encoder circuits, and the keyboard cable. The test procedure also checks the operation of the shift and control keys in combination with other keys.

To run the test:

1) Boot the Apple][Product Diagnostics diskette.

2) Use the <ESC> key to move the cursor to the KEYBOARD TEST line on the main menu, then press <RETURN>.

After the test is loaded, an introductory screen will be displayed. This screen tells you how to run the test, and explains what you will see on the test screen.

3) Press any key to proceed to the test. When the test screen is displayed, blank out the keyboard "picture" by pressing keys. Make sure that you test both shift keys in the process. To extinguish the inverse characters, hold down the <CTRL> key and press the appropriate letter keys. The <ESC>, <RETURN>, and < ARROW> keys blank out the brackets, backslash, and underscore that represent them on the "picture".

4) After all of the "keys" are blanked out, press the SPACEBAR to return to the menu.

If any single key fails the test, replace the keyboard mechanical assembly (or just the key if you wish). Any other problem indicates a bad keyboard electronic assembly (piggy-backed to the rear of the keyboard mechanical assembly) or the cable, so replace one of them (then the other if the problem remains). After replacing the appropriate module, run the test again.

G. GAME PADDLE/BUTTON TEST

You would use this test if the customer complains that his paddles aren't working properly.

This test allows you to check the game paddles/buttons, and the circuitry on the motherboard that interfaces with the paddles/buttons.

To run the test:

1) Connect the Game Paddles to the GAME I/O socket near the right rear corner of the motherboard (to the right of the front end of the last peripheral slot).

2) Boot the Apple][Product Diagnostics diskette.

3) Use the <ESC> key to move the cursor to the GAME PADDLE/BUTTON TEST line on the main menu, then press <RETURN>.

After the test is loaded, an introductory screen will be displayed. This screen explains how to use the test screen.

4) Press any key to get to the test screen. Markers on the bottom and right edges of the white square show the actual values being read from the paddles.

5) Slowly rotate each paddle control through its entire range. The asterisk should move around the white area. The markers should keep pace, indicating values from 0 to 255. The sweep of values should cover the full range of rotation of the control (i.e. they shouldn't read 0 or 255 when the control isn't near one of it's limits).

6) Push each paddle button. The white area should turn black and the asterisk should turn white. The "colors" will swap repeatedly if the button is held in.

7) Press <ESC> to return to the main menu when you have finished.

If any part of the test fails, replace the paddles and run the test again. If it still fails, replace the motherboard and run the test again. Alternatively you could test the paddles on a system with a known good motherboard. If the test fails there, the paddles are bad; if it passes, the motherboard in the customer's system is bad.

H. TAPE READ/WRITE/VERIFY TEST

You would use this test when the customer complains that he can't save data or programs on tape or can't read them from tape.

This test checks the tape recorder itself, the audio cables, and the circuitry on the motherboard that writes to and reads from a tape recorder. It can also be used to "calibrate" a tape recorder to work with the system.

To run this test:

1) Connect a cable between the CASSETTE OUT jack on the rear of the Apple][and the input (MIC) jack on the recorder (this is for the write phase). Connect another cable from the output (MON) jack on the recorder to the CASSETTE IN jack on the Apple][(this is for the read phase).

2) Put a scratch (expendable) tape in the recorder and rewind it. Set the record and playback levels to mid-range.

3) Boot the Apple][Product Diagnostics diskette.

4) Use the <ESC> key to move the cursor to the TAPE READ/WRITE/VERIFY TEST line on the main menu, then press <RETURN>.

Instructions will be displayed for each phase of the test. Simply follow them as they appear. The write phase and read phase will each take about 10 seconds.The message "TAPE READ/WRITE TEST OK" will appear after the test is finished.

If errors are found, you will be told to readjust the recorder and try again.

If the test locks up (doesn't do anything new after a long time), it means that nothing is being read from the tape. Make sure that the recorder is working (you can test it with a microphone and your voice). The cables must also be good to carry the signal both ways. Check them for continuity and shorts, or try a different set. The volume level must also be correctly set - that is a trial and error process (the technical specification is 1V peak-to-peak at the CASSETTE INput jack).

If the recorder is working and set up properly (maybe it works with another system?) and the cables are good, replace the motherboard and run the test again.

I. COLOR BAR TEST

You would use this test if the customer complained about display problems.

This test allows you to check the display device (monitor or TV), the video cable, and the video generating circuitry on the motherboard.

To run the test:

1) Boot the Apple][Product Diagnostics diskette.

2) Use the <ESC> key to move the cursor to the COLOR BAR TEST line on the main menu, then press <RETURN>.

An introductory screen will be displayed, giving instructions on how to use the test screen. You are also given a choice of returning to the main menu or proceeding with the test.

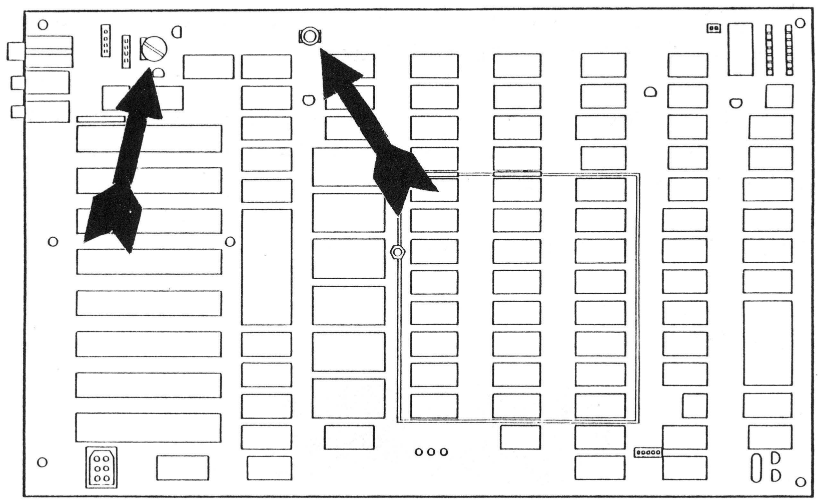
3) Press <RETURN> to proceed with the test.

CONTINUED ON REVERSE

The test screen that is displayed consists of a set of color bars in a frame. The numbers along the bottom of the frame are the color codes. The colors are:

0=black	1=magenta	2=dark blue	3=purple
4=dark green	5=grey	6=med blue	7=light blue
8=brown	9=orange	10=grey	11=pink
12=green	13=yellow	14=aqua	15=white

NOTE: Don't try to adjust the color trimmer capacitor on a black and white display; you won't see any changes.



4) When you are finished, press <ESC> to return to the main menu.

If the picture cannot be made acceptable, try a different monitor and/or cable and run the test again. If the problem persists, replace the motherboard and run the test again.

J. GRAPHICS TABLET TEST

You would use this test if the customer complained about problems with a graphics tablet.

This test allows you to check the operation of the Graphics Tablet, Graphics Tablet Pen, and Graphics Tablet Interface Card.

To run the test:

1) Install the Graphics Tablet Interface card in slot 4 and connect the tablet and pen to it.

2) Boot the Apple][Product Diagnostics diskette.

3) Use the <ESC> key to move the cursor to the CARD TESTS line on the main menu, then press <RETURN>.

4) Use the <ESC> key to move the cursor to the GRAPHICS TABLET TEST line on the card tests menu, then press <RETURN>.

5) The first screen lists some things that must be done before the test will run. If any of the conditions have not been met, do whatever is necessary to meet them and start again. Otherwise, press <ESC> to continue.

The test will check the ROM on the interface card and report whether it is good or bad, give you instructions on adjusting the interface card, display a set-up screen for doing the adjustment, give instructions for testing the tablet, display a screen for that test, and tell you if the tablet works.

If the ROM test fails, replace the ROM and run the test again. If you can't get the correct display during the interface card adjustment, replace the pen and run the test again. If the attempted repair doesn't fix the problem, replace the interface card. If you get missing dots during the surface test, replace the tablet.

K. APPLESOFT/INTEGER ROM CARD TEST

You would use this test if the customer complained about problems in running programs written in the type of BASIC contained on the firmware card.

This test checks each ROM in the APPLESOFT or INTEGER set on a firmware card, whichever is installed.

To run the test:

1) Install the firmware card in slot 0.

2) Boot the Apple][Product Diagnostics diskette.

3) Use the <ESC> key to move the cursor to the CARD TESTS line on the main menu, then press <RETURN>.

4) Use the <ESC> key to move the cursor to the APPLESOFT/INTEGER ROM CARD line on the card test menu, then press <RETURN>.

NOTE: This test MUST be observed during operation as it does not "keep records" and report its results as the RAM test does.

The test will run with no more inputs from you. As each ROM is tested the program will display the name of the ROM. After testing the ROM it will report either "NO ERRORS FOUND" (for a good ROM) or "CAN'T MATCH CODE" (for a bad one), then it will go on to the next ROM. When all of the ROMs have been tested, it will return to the card test menu.

If any of the ROMs fail, replace it and run the test again.

L. LANGUAGE CARD TEST

You would use this test if the customer complained about problems loading or running programs that use the language card (e.g. Pascal, Pilot, Logo, Fortran, Cobol, etc.).

This test checks the RAM and the Autostart ROM located on the language card. The disk drive is activated during the test to create electrical noise and to put a heavy load on the power supply. These conditions make it more likely that marginal RAM will fail.

To run the test:

1) Install the Language card in slot 0. The cable replaces the RAM IC at location E3 on the motherboard (the left rear corner of the outlined memory area).

2) Boot the Apple][Product Diagnostics diskette.

3) Use the <ESC> key to move the cursor to the CARD TESTS line on the main menu, then press <RETURN>.

4) Use the <ESC> key to move the cursor to the LANGUAGE CARD line on the card test menu, then press <RETURN>.

The test will check the language card RAM and display the results. The results screen has a mini-menu at the bottom that works with the <ESC> and RETURN keys as the other menus do. RETEST and BEGIN CONTINUOUS TEST refer to the RAM test only, not to the entire language card test.

5) Select PROCEED WITH TEST and press <RETURN>.

The test will display two status pages, then test the Autostart ROM. You'll have to press a key to proceed from each of those steps to the next. For the ROM test, the message "NO ERRORS ENCOUNTERED" (for a good ROM) or "CANNOT MATCH CODE" (for a bad ROM) will be displayed briefly (so you must be watching) before the test returns to the card test menu

If any RAM is shown as bad on the results screen, replace the bad IC and run the test again. If any status states are bad, replace the language card and run the test again. If the ROM fails, replace the ROM and run the test again.

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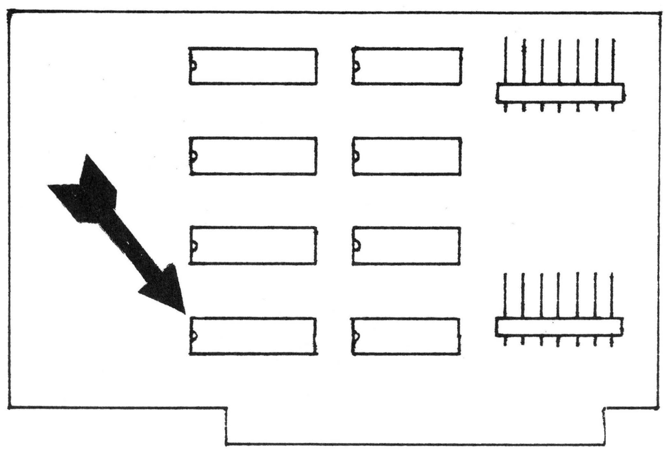
M. DISK I/F CARD TEST

You would run this test if the customer complained about problems in saving programs or data to a diskette, or loading them from a diskette.

This test checks the P5 or P5A PROM installed at location D3 on the disk interface card, whichever is installed.

To run the test:

1) Note whether the Disk Interface card has a P5 (341-0027) or a P5A (341-0028) PROM installed at location D3.



2) Install the Disk Interface card in slot 6.

NOTE: If you are unable to boot using the Interface card being tested (because it has a P5 PROM or won't work), install it in a slot other than 0 or 6, and boot with a known good interface card in slot 6.

3) Boot the Apple][Product Diagnostics diskette.

4) Use the <ESC> key to move the cursor to the CARD TESTS line on the main menu, then press <RETURN>.

5) Use the <ESC> key to move the cursor to the DISK I/F CARD line on the card test menu, then press <RETURN>.

CONTINUED ON REVERSE

6) When prompted to do so, enter the slot number where the Disk Interface Card is installed.

7) When asked if the language card PROM is installed, answer Y if there is a P5A PROM or N if there is a P5 PROM on the card.

NOTE: This test MUST be observed while running, as it doesn't "keep records" or maintain a results display like the RAM test.

The test will finish with no more inputs from you. If the PROM checks out OK, it will tell you so. If not, the message "UNABLE TO MATCH CODE" will be displayed. After reporting its results, it returns to the card test menu.

If the PROM fails, replace it and run the test again. If the problem persists, replace the interface card and run the test again.

N. PRINTER CARD TEST

You would use this test if the customer complained about problems in the operation of a parallel printer (i.e. Epson or Centronics).

This test checks the PROM on the APPLE Parallel Interface card.

To run the test:

1) Install the Parallel Interface card in slot 1.

2) Boot the Apple][Product Diagnostics diskette.

3) Use the <ESC> key to move the cursor to the CARD TESTS line on the main menu, then press <RETURN>.

4) Use the <ESC> key to move the cursor to the PRINTER CARD line on the card test menu, then press <RETURN>.

5) When prompted to do so, enter the slot number where the Parallel Interface card is installed (slot 1).

NOTE: This test MUST be observed during operation, as it doesn't "keep records" and it returns to the menu when it is done.

The test will run with no further inputs from you. When it is done, it will report "CODE CHECKS OUT OK" for a good PROM or UNABLE TO MATCH CODE" for a bad one.

If the PROM fails the test, replace it and run the test again. If the problem persists, replace the interface card.

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O. SERIAL/COMMUNICATIONS CARD TEST

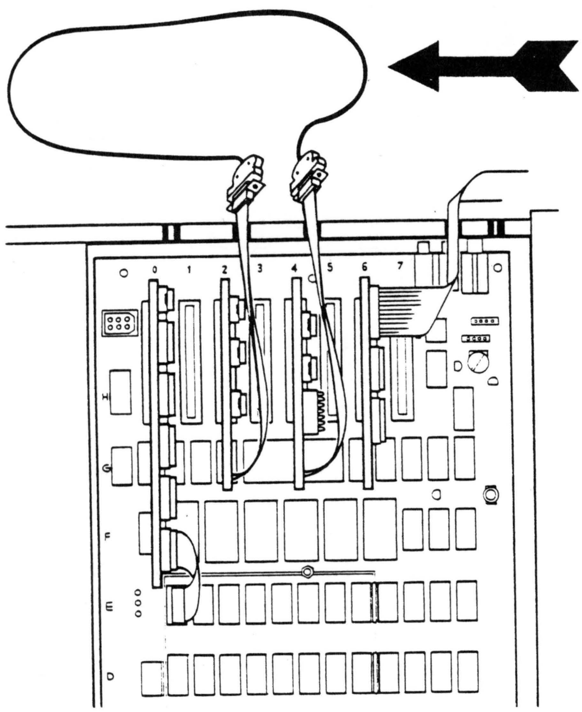
You would use this test if the customer complained about problems in the operation of a serial printer (e.g. Qume or Diablo) or modem.

This test checks the Apple Serial Interface card and the Apple Communications Interface card. Both cards must be installed for the test to operate.

To run the test:

1) Install the Serial interface card in slot 1, and the Communications interface card in slot 2.

2) Connect a loop-back jumper cable between the Serial Interface and Communications Interface connectors.



3) Boot the Apple][Product Diagnostics diskette.

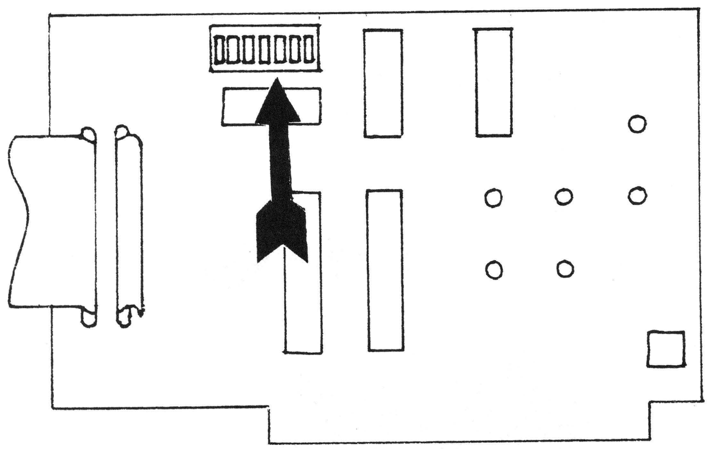
4) Use the <ESC> key to move the cursor to the CARD TESTS line on the main menu, then press <RETURN>.

5) Use the <ESC> key to move the cursor to the SERIAL/COMMUNICATION CARD line on the card test menu, then press <RETURN>.

CONTINUED ON REVERSE

6) When prompted to do so, enter the slot numbers for the Serial Interface card (slot 1) and the Communications Interface card (slot 2). The test will check the PROMs on both cards, reporting their status (CODE CHECKS OUT OK or UNABLE TO MATCH CODE).

7) When the switch test screen appears, make sure that the picture matches the actual DIP switch positions on the Serial card. Then manipulate each switch to both of its positions and watch to see that the picture follows the switch. Finish up with all of the switches ON except switch #2.



8) Press <ESC>. When the communications test screen appears, slowly type a few characters. The characters that you type should appear on both the SENT and RECEIVED lines.

9) When you are satisfied that the communication from Serial card to Communications card is good (about 8 characters), press <ESC> ONCE. This will reverse the direction of the test. The screen will look almost identical except for the labels on the SENT and RECEIVED lines.

10) Slowly type a few more characters. They should appear on the SENT and RECEIVED lines as you type them.

11) When you are satisfied that the Communications card is talking to the Serial card properly, press <ESC>.

The test will display a status screen, telling you what revision PROMs are on each card and whether the cards are working properly.

If any of the PROMs fails the test, replace it. If the problem persists, replace the appropriate card. If the switch setting test doesn't work, replace the Serial card. If the communication test fails, replace the Serial card. If it still fails, replace the Communications card. After any of these actions, run the test again.

P. SILENTYPE TEST

You would use this test if the customer complained about poor print quality or any problems in the operation of the Silentype.

This test checks the PROM and RAM on the Silentype Interface card and the various functions of the printer mechanism. You have the option at the beginning of the test of printing a printer alignment pattern instead of running the test.

To run the test:

1) Install the Silentype Interface card in slot 1 and connect the Silentype to it.

2) Boot the Apple][Product Diagnostics diskette.

3) Use the <ESC> key to move the cursor to the CARD TESTS line on the main menu, then press <RETURN>.

4) Use the <ESC> key to move the cursor to the SILENTYPE TEST line on the card test menu, then press <RETURN>.

5) When given the option of aligning the print head, reply "N" (unless you are doing an alignment, which is beyond the scope of this lesson).

The test will check the PROM (firmware) and RAM on the Silentype Interface card and report the status of each. It will then check the margin switch on the Silentype and report its status.

6) The test will now exercise the carriage and paper drives, printing and variable intensity circuits, and bi-directional print function. It takes a few seconds after the screens appear before the tests actually start. Judge the printer's performance in each step according to the standards given by the diagnostic. Enter "Y" if it is acceptable or "N" if it isn't. If all of the tests pass, the test will return to the card test menu.

It would be redundant to list here what you should do if a part of the Silentype test fails, because a list of recommended corrective actions is provided by the test itself in the event of failure (including if you tell it that the result of one of the print function tests was unacceptable).

Apple][Technical Procedures

Section 3

Troubleshooting

Contents:

Apple][Troubleshooting Chart

NOTE: The Probable Causes are listed in the order of probable failure. It is recommended that Probable Causes are checked or replaced in the order listed.

Symptom	Probable Cause
Apple will not boot; drive comes on.	1) RAM row E. 2) RAM on Language Card at location E2. 3) Motherboard
Programs run erratically, often crash.	1) RAM 2) Motherboard
No beep and no message is displayed; monitor has random characters on screen when the Apple is turned on; drive does not come on.	1) RAM row C. 2) "F8" ROM at location F3 on the motherboard. 3) "F8" ROM on the Language Card at location E2. 4) Motherboard
Peripheral does not work properly.	1) Motherboard
Keys fail to remove appropriate character from the keyboard test on the Apple][diagnostic.	1) Keyboard Cable 2) Keyboard Electronic 3) Keyboard Mechanical 4) Motherboard
Applesoft or Integer BASIC fails to operate or is erratic.	1) ROM 2) Motherboard
Game I/O port malfunction (Check with diagnostic.)	1) Game Paddles 2) Motherboard
All video malfunctions (Graphics and Text)	1) Motherboard
Cassette Interface malfunction	1) Motherboard

Apple][Troubleshooting Chart

Symptom	Probable Cause
Apple][system dead. (No beep, no video, no power light)	1) Power Supply 2) Motherboard
Apple][system dead (No beep, no video, power light on).	1) Power Supply 2) Motherboard
Speaker malfunction	1) Speaker 2) Motherboard
No video display	1) Video Cable 2) Video pot adjustment 3) Motherboard

Apple][Chip Swapping Chart

Symptom	Location(s)	Defective Chip Type
Dead Apple System (Power On Light)	A2	74LS00
	B1	74S174
	B2	74S86
	B13	74LS02
	C1	74LS153
	C2	74LS195
No RESET or No Response	A13	555
	B5	74LS174
	B6	74LS257
	B7	74LS257
	B8	74LS174
	B11	74LS08
	C14	74LS32
	E11,12,13	74LS153
	F12	74LS138
	F13	74LS138
	F14	9334
	H1	74LS08
	H3,4,5	8T97
	H8	6502
	H10,11	8T28
	H14	74LS5251
Apparent ROM Problems	F12	74LS13
	H1	74LS08
Apparent RAM Problems	A2	74LS00
	B5,8	74LS174
	C14	74LS32
	D2	74LS20
	E2	74LS139
	E11,12,13	74LS153
	F2	74LS139
	H1	74LS08
No Video (Speaker does Beep)	A2	74LS00
	A8	74LS257
	A9	74LS151
	A10	74LS194
	B2	74S86
	B10	74LS74
	B13	74LS02
	C2	74LS195
	C11	74LS04
	D11,12,13,14	74LS161

Apple][Chip Swapping Chart

Symptom	Location(s)	Defective Chip Type
No Text Mode	A3	74166
	A5	1513
	A8	74LS257
	A9	74LS151
	A10	74LS194
	B2	74S86
HIRES or LORES Problem	A0	74LS194
	A8	74LS257
	A9	74LS151
	A11	74LS74
	B4,9	74LS194
	B10	74LS74
	C11	74LS04
	C12	74LS257
	F14	9334
	H1	74LS08
	J1	74LS257
Dark Screen	A2	74LS00
	B1	74LS174
	B2	74S86
	C1	74LS153
	C2	74LS195
V or H SYNC Fails	C13	74LS51
	C14	74LS32
	D11,12,13,14	74LS161
Wrong Page or Video Mode	B5,8	74LS174
	B11	74LS08
	B12	74LS11
	B13	74LS02
	C11	74LS04
	C12	74LS257
	E11,12,13	74LS153
	E14	74LS283
	F2	74LS139
	F14	9334
	H1	74LS08
	J1	74LS257

Apple][Chip Swapping Chart

Symptom	Location(s)	Defective Chip Type
Wrong or Bad CHRS	A3	74166
	A5	1513
	B5,8	74LS174
	B6,7	74LS257
Bad Cursor	A3	74166
	B2	74S86
	B11	74LS08
	B13	74LS02
Bad Graphics	A8	74LS257
	A9	74LS151
	A10	74LS194
	A11	74LS74
	B4,9	74LS194
No Color	B12	74LS11
	B13	74LS02
	C13	74LS51
Game Paddles Problem	F13	74LS138
	H13	558
	H14	74LS251
Cassette Loading Problem	F13	74LS138
	H14	74LS251
	K12	741 OP AMP
Cassette Saving Problem	F13	74LS138
	K13	74LS74
Speaker Problem	F13	74LS138
	K13	74LS74
Keyboard Problem	A12	74LS02
	B6,7	74LS257
	B10	74LS74
	C11	74LS04
	F13	74LS138
Peripheral Card in Slot Won't Work	H2,12	74LS138

Apple ///

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Apple /// Technical Procedures

Section 1

Takeapart

Contents:

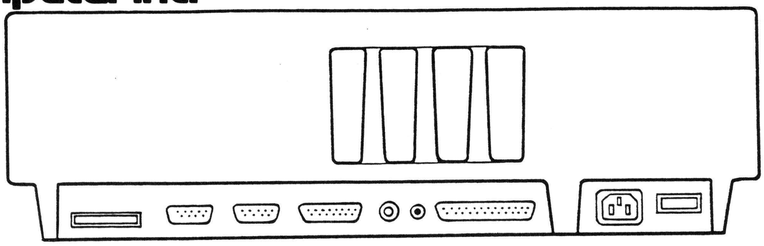


FIGURE 1

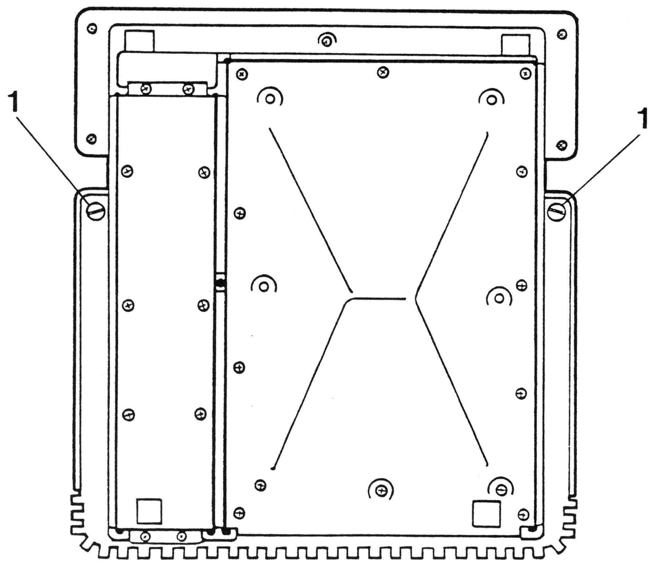


FIGURE 2

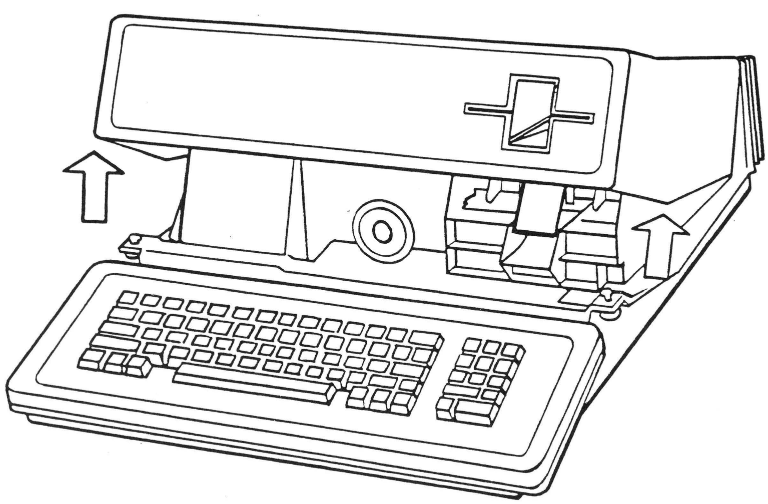


FIGURE 3

A. REMOVING THE COVER

1. Power down and disconnect the AC power cord from the source and then from the back of the Apple ///.

2. Disconnect all other external cables from the back of the Apple ///. (See Figure 1).

3. Lift up the front edge of the Apple and tip it up so it rests on the back of the casing.

4. Use a flat blade screwdriver to turn the locking screws, one on each side of the Apple III, 1/4 turn counterclockwise. (See Figure 2, Item 1).

   DO NOT REMOVE THESE SCREWS--they are self-capturing and are supposed to stay in.

5. Lower the Apple /// to the operating position and with a hand on each side, lift the cover up and pull it forward to remove it. (See Figure 3).

B. REPLACING THE COVER:

1. With the Apple /// in operating position, place the cover on making sure that it is seated properly all the way around. Be sure that the four tabs on the back of the cover fit into the four slots in the back of the Apple.

2. Tip up the front edge of the Apple and tighten the two locking screws by turning them 1/4 turn clockwise.

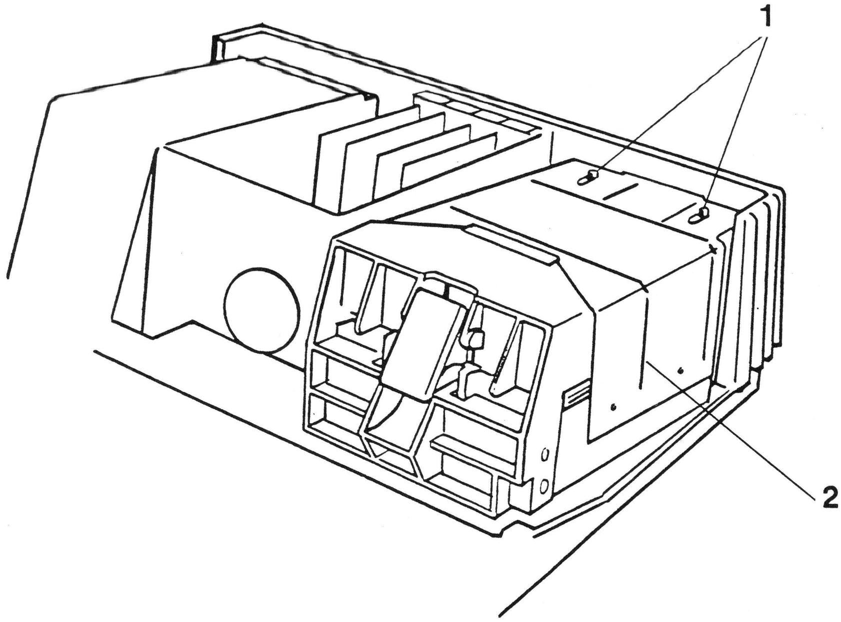


FIGURE 4

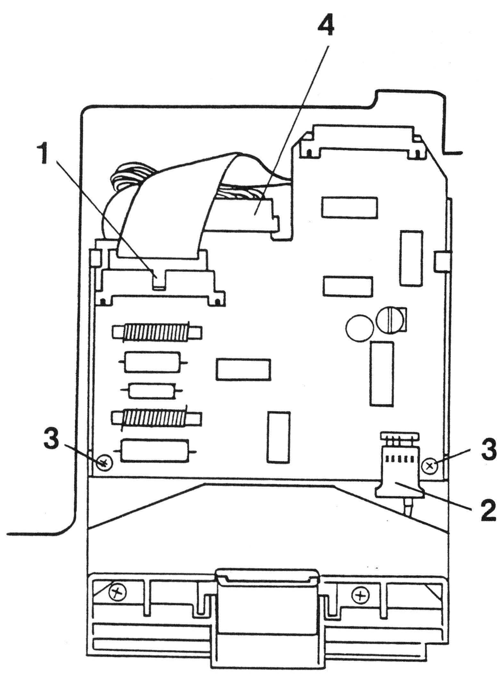


FIGURE 5

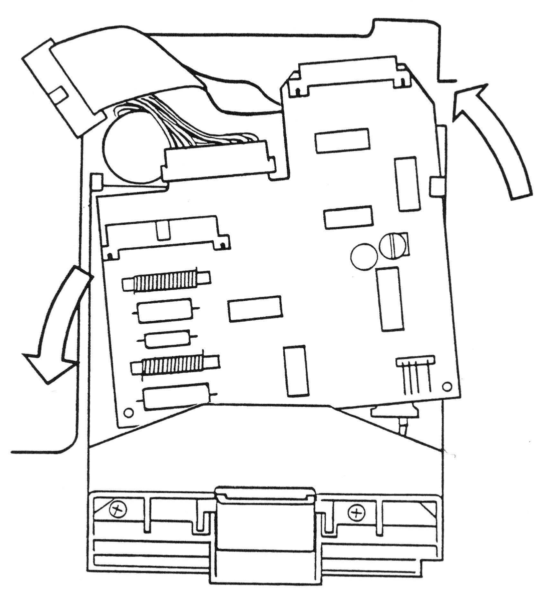


FIGURE 6

C. REMOVING THE ANALOG BOARD

1. Remove the cover.

2. To get to the analog board you must first remove the disk assembly shield. To do this, use a flat blade screwdriver to slide the two Tinnerman retaining clips on the disk assembly shield forward. (See Figure 4, Item 1).

   NOTE: The clips should come off easily. However, they sometimes fly so you should keep a finger on them.

3. Remove the disk assembly shield by flexing the side out (See Figure 4, Item 2) and lifting up on the shield.

   The shield is only retained by the spring tension of the sides and four dimples which fit into depressions of the disk casting.

4. Disconnect the disk ribbon cable. If it is hard to remove, work it off by pushing on the center tab or the sides of the plug with a small screwdriver. DO NOT PULL IT OUT BY THE CABLE! (See Figure 5, Item 1).

5. Disconnect the read/write head cable. (See Figure 5, Item 2).

   NOTE: Do not try to remove the motor control cable yet. (see Figure 5, item 4).

6. Remove the two small Phillips head mounting screws which hold the analog board at the front of the casting. (See Figure 5, Item 3).

7. Remove the analog board by gently twisting it counterclockwise and moving it forward until it clears the guide on the left. Unhook it from the guide on the right. (See Figure 6).

8. Remove the motor control plug (Figure 5, Item 4) by disengaging the four nylon locking pawls which engage the two holes in the board from both top and bottom. Lift the pawls free and disconnect the motor control cable.

D. REPLACING THE ANALOG BOARD

1. Connect the motor plug. Make sure the nylon pawls are engaged in the holes.

2. Turn the board slightly counterclockwise and hook the board under the right retainer and then the left retainer.

3. Replace the two screws in front.

4. Replace the disk ribbon cable.

5. Replace the read/write head cable.

6. Replace the disk assembly shield.

7. Replace the Tinnerman clips by putting them over the posts and sliding them back. Use a screwdriver to press down firmly on the sides of the clips to secure them.

8. Replace the cover.

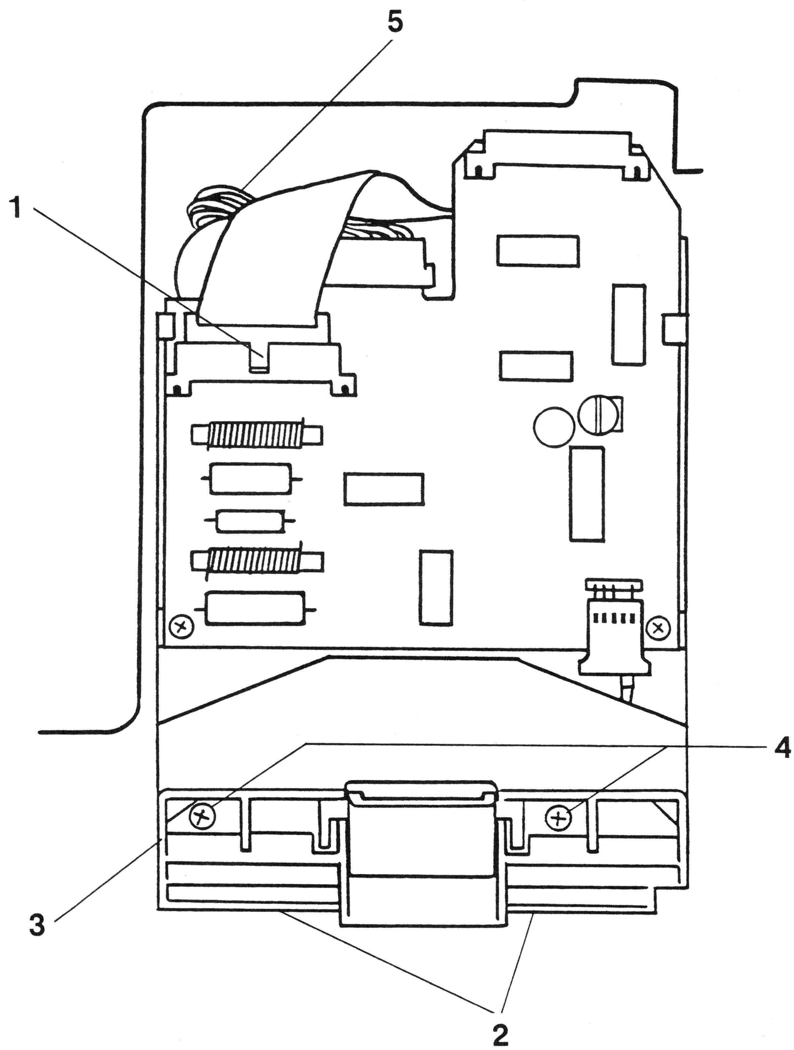


FIGURE 7

E. REMOVING THE DISK ASSEMBLY

1. Remove the cover.

2. Remove the Analog card.

3. Draw a pencil line on the Apple III chassis along the front (See Figure 7, Item 2) and left side (Figure 7, Item 3) of the disk assembly bezel. This will serve as a location reference when the disk assembly is re-inserted.

4. Loosen completely (but don't remove yet) the two Phillips head screws that mount the disk assembly to the Apple /// chassis. They can be seen by looking down through the front diskette guide and door assembly. (See Figure 7, Item 4).

5. Loosen but don't remove the screw in the double retaining clip that secures the back of the disk assembly. (See Figure 7, Item 5).

6. Remove the assembly by sliding it forward until it clears the retaining clip. Lift it from the chassis.

7. Recover the two front screws from the disk assembly.

F. REPLACING THE DISK ASSEMBLY

1. Slip the disk assembly under the double retaining clip so that the front is in line with the pencil line you drew earlier.

2. Replace the two front screws.

3. Tighten the retaining clip screw in the back.

4. Replace the Analog card.

5. Replace the cover.

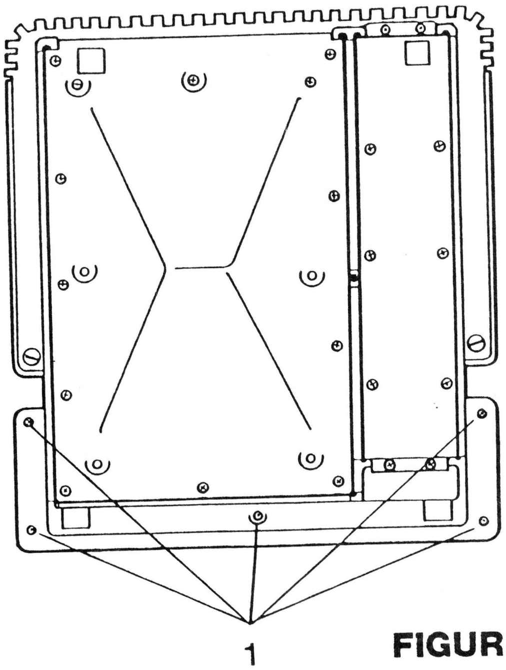


FIGURE 8

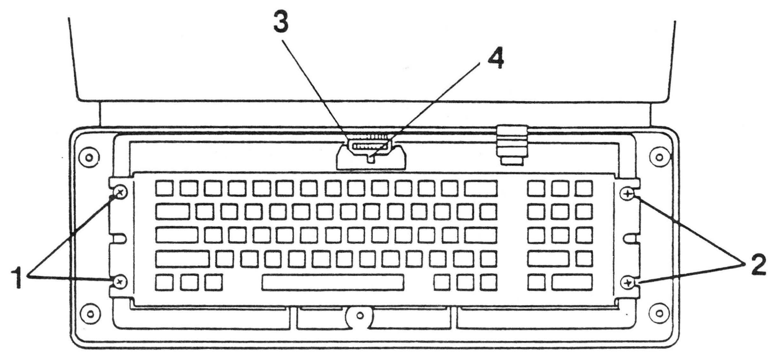


FIGURE 9

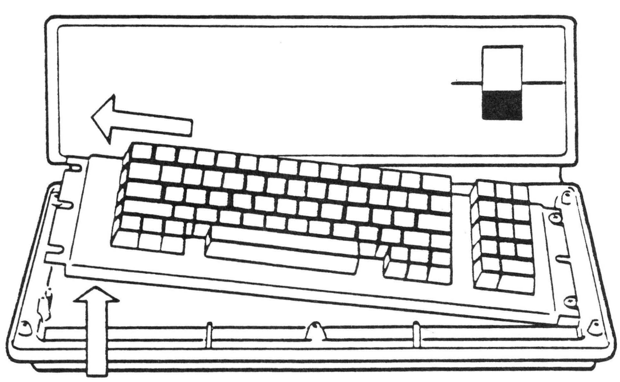


FIGURE 10

G. REMOVING THE KEYBOARD

1. Check to see that the power is off on the Apple /// and that the AC power cord is disconnected.
2. Turn the Apple completely over.
3. Remove the five keyboard cover mounting screws. (See Figure 8, Item 1).
4. Remove the keyboard cover.
5. Turn the Apple rightside up again.
6. Remove the two retaining screws on the left end of the keyboard. (See Figure 9, Item 1).
7. Loosen but don't remove the two retaining screws on the right. (See Figure 9, Item 2).
8. Remove the keyboard by lifting the left end and sliding the right end from under the loosened screws. (See Figure 10).
9. Disconnect the keyboard cable (See Figure 9, Item 3) by using a screwdriver to push on the tab or the sides of the cable connector (See Figure 9, Item 4).

   CAUTION: Do not pull on the cable!

H. REPLACING THE KEYBOARD

1. Replace the keyboard cable. Make sure it wraps tightly around the printed circuit board and does not stick out.
2. Replace the keyboard.
3. Replace the two retaining screws on the left end of the keyboard.
4. Tighten down the two screws on the right side of the keyboard.
5. Replace the keyboard cover.
6. Tip the Apple /// up, keeping one hand on the loose keyboard cover.
7. Carefully replace the five keyboard cover mounting screws. Don't overtighten them because they are just threaded into the plastic of the cover and will strip very easily.

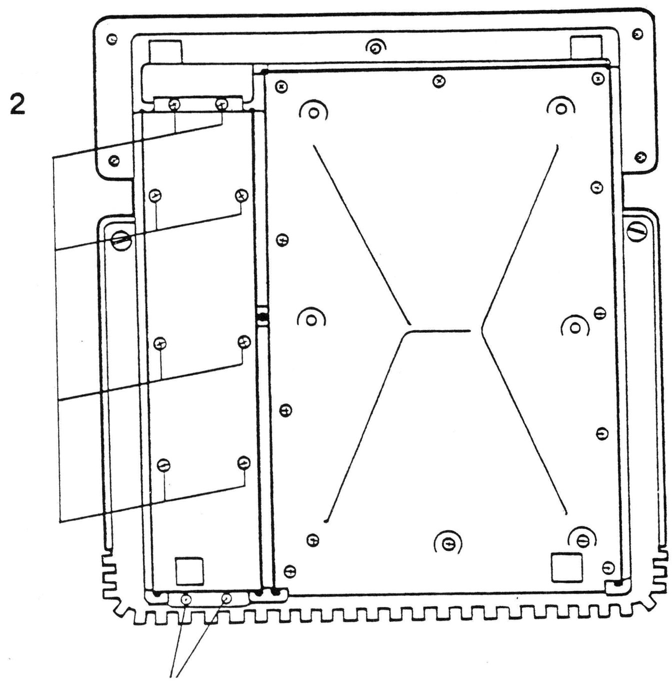


FIGURE 11

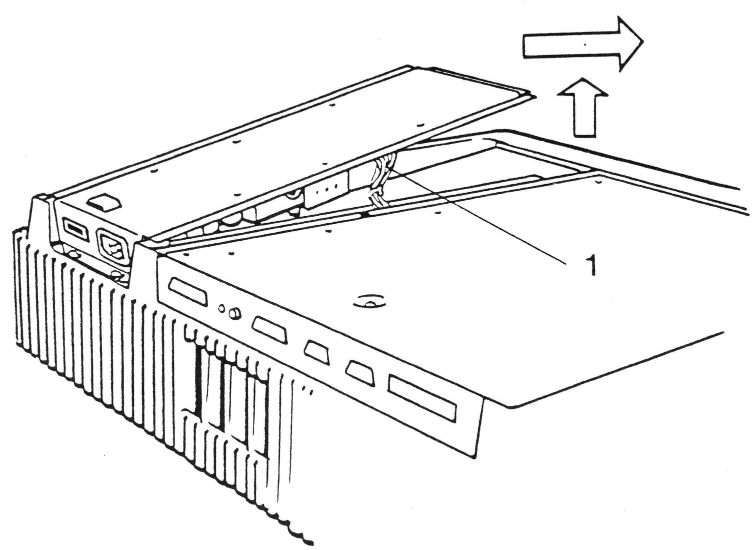


FIGURE 12

I. REMOVING THE POWER SUPPLY

1. Make sure that the power is off on the Apple /// and that the AC power and all other external cables are disconnected.

2. Turn the Apple upside down with the back facing you, putting it on a soft pad.

3. Loosen but don't remove the two Phillips head screws located on the rear edge of the power supply bottom cover, near the on/off switch and power supply receptacle. (See Figure 11, Item 1).

4. Completely loosen the eight screws that secure the power supply to the chassis. Do not try to take them out (See Figure 11, Item 2).

5. Lift up the edge of the power supply and slide it until it clears the two rear mounting screws. Lift the power supply out. (See Figure 12).

6. Turn the power supply over.

7. Disconnect the power supply connector by squeezing in on the tabs and gently (with a rocking motion) pull the connector out. (See Figure 12, Item 1).

8. If there is a wire tie holding the cable, clip it.

J. REPLACING THE POWER SUPPLY

1. Place a new wire tie on the cable.

2. Plug in the cable connector.

3. Replace the power supply. Slide the cover under the two rear screws and lower the power supply into place.

4. Tighten down all the screws. BE CAREFUL! DON'T FORCE THE SCREWS! If excessive force is applied, the screws will strip out the chassis. Make sure the screws are not crossthreaded. If one doesn't go in easily, back it out and try again.

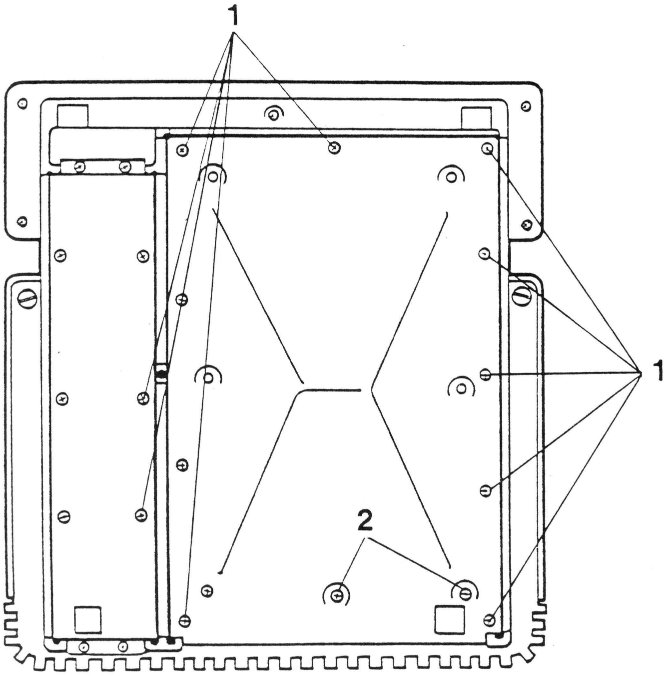


FIGURE 13

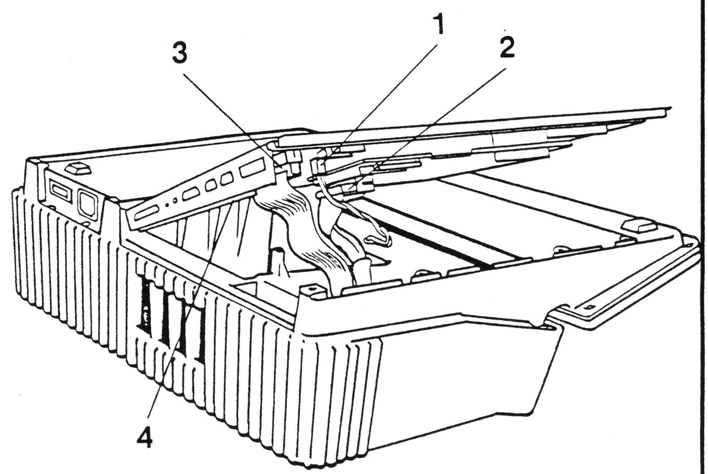


FIGURE 14

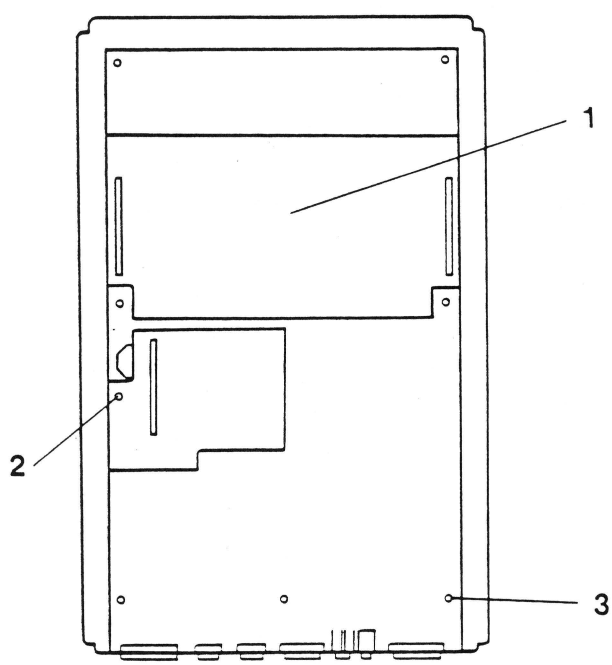


FIGURE 15

K. REMOVING THE MAIN LOGIC ASSEMBLY

1. Make sure that the power on the Apple is off and that all external cables are disconnected.

2. Tip up the Apple ///.

3. Remove the two locking screws that hold the cover on.

4. Remove the cover.

5. Remove any peripheral cards installed in slots 1 - 4.

6. Put the Apple cover back on to protect the disk bezel.

7. Place the Apple upside down and put it on a pad with the rear facing you.

8. Completely loosen (but don't remove) the ten Phillips screws around the edge of the logic access panel. (See Figure 13, Item 1).

9. Completely loosen (but don't remove) the two additional recessed screws that are about one and a half inches in from the rear edge of the panel. (See Figure 13, Item 2).

10. Lift up the logic board carefully from the right side. Allow the panel to remain resting on its edge nearest the power supply. (See Figure 14).

11. While holding the logic board on the underside, disconnect the speaker cable (See Figure 14, Item 1), the keyboard cable (Figure 14, Item 2), and the disk drive cable (Figure 14, Item 3). Note which plug goes where.

12. Lift the assembly so that you can unplug the power supply plug. (Figure 14, Item 4).

13. Lift out the logic assembly.

14. Lift up and remove the encoder board from its connector. (See Figure 15, Item 2). You may also have to lift it off a standoff that is on the main logic board of some Apple /// 's.

15. Place the logic assembly flat on the work surface, use both hands to lift off the memory board (See Figure 15, Item 1) from the main logic board (Motherboard).

NOTE: Lift the memory board straight up so that the male connector pins mounted on the main logic board will not be bent or broken.

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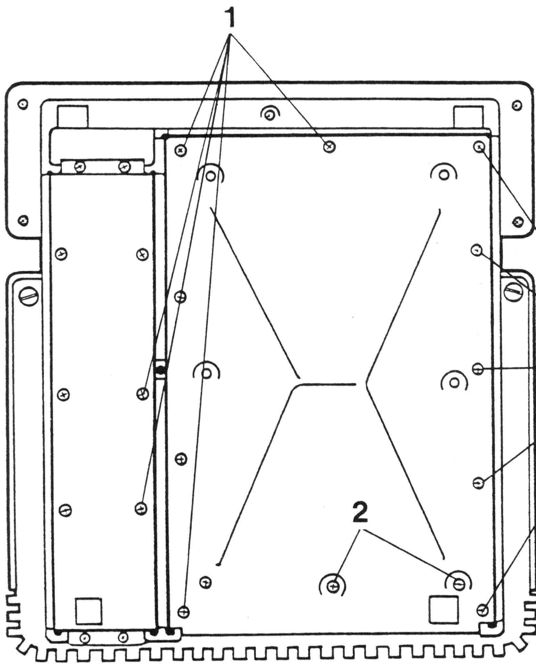


FIGURE 13

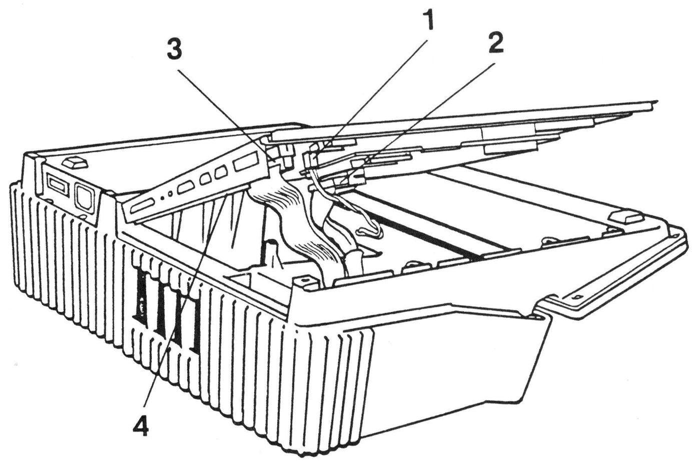


FIGURE 14

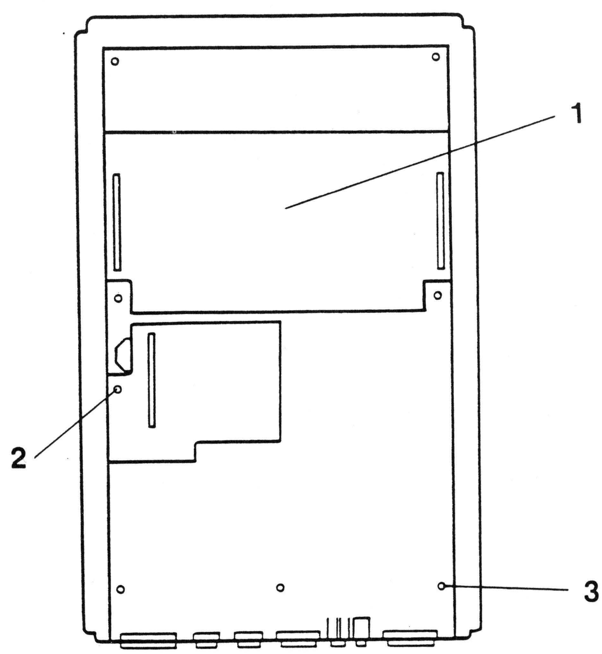


FIGURE 15

16. Remove the retaining nut or screw on the main logic board. (See Figure 15, Item 3).

17. Ease the plugs out of the back.

18. Slide out the board from the peripheral connector opening of the access panel.

L. REPLACING THE MAIN LOGIC ASSEMBLY

1. Make sure the insulating shield is in place to keep the board from shorting on the access panel.

2. Replace the main logic board by slipping the peripheral connectors into their cutouts in the rear access panel, and replacing the retaining screw with the nutdriver (Figure 15, Item 3).

3. Replace the encoder board. (Figure 15, Item 2).

4. Replace the memory board. (Figure 15, Item 1). Make sure the memory board is properly oriented. The RAM chips on the memory board point in the opposite direction to the chips on the main logic board. The notches on the memory board IC's should be facing the output connectors.

   Align the end pin in the end hole of the main memory board and then tip the board flat. When all pins are properly started, press it gently but firmly into place.

5. Rest the access panel on the power supply side and reach under and plug in the power supply. (Figure 14, Item 4).

6. Plug in the disk cable. (Figure 14, Item 3).

7. Plug in the keyboard cable. (Figure 14, Item 2).

8. Plug in the speaker cable. (Figure 14, Item 1).

9. Put the entire logic assembly panel in place and tighten down the 12 Phillips screws on the logic assembly access panel. (See Figure 13, Items 1 and 2).

10. Turn the Apple /// rightside up.

11. Remove the cover.

12. Replace the peripheral cards.

13. Replace the cover.

Apple /// Technical Procedures

Section 2

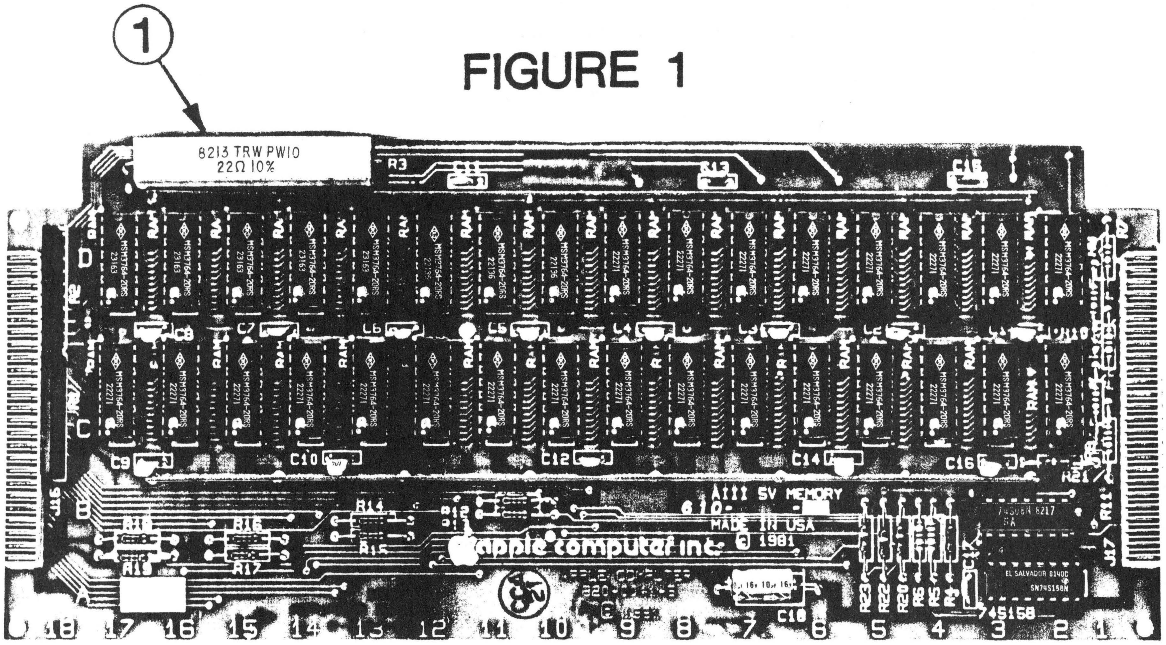
Diagnostics

Contents:

The Apple /// Dealer Diagnostics diskette (P/N 077-0013A) is to be used with the Troubleshooting Flowchart (below, section 3). This section describes how to run the tests on the diskette. Normally (see section D) you will use the TEST ALL option to run all the tests in sequence. If you wish to run or repeat an individual test, simply use the up- and down-arrow keys to select that test from the main menu and press RETURN to accept it.

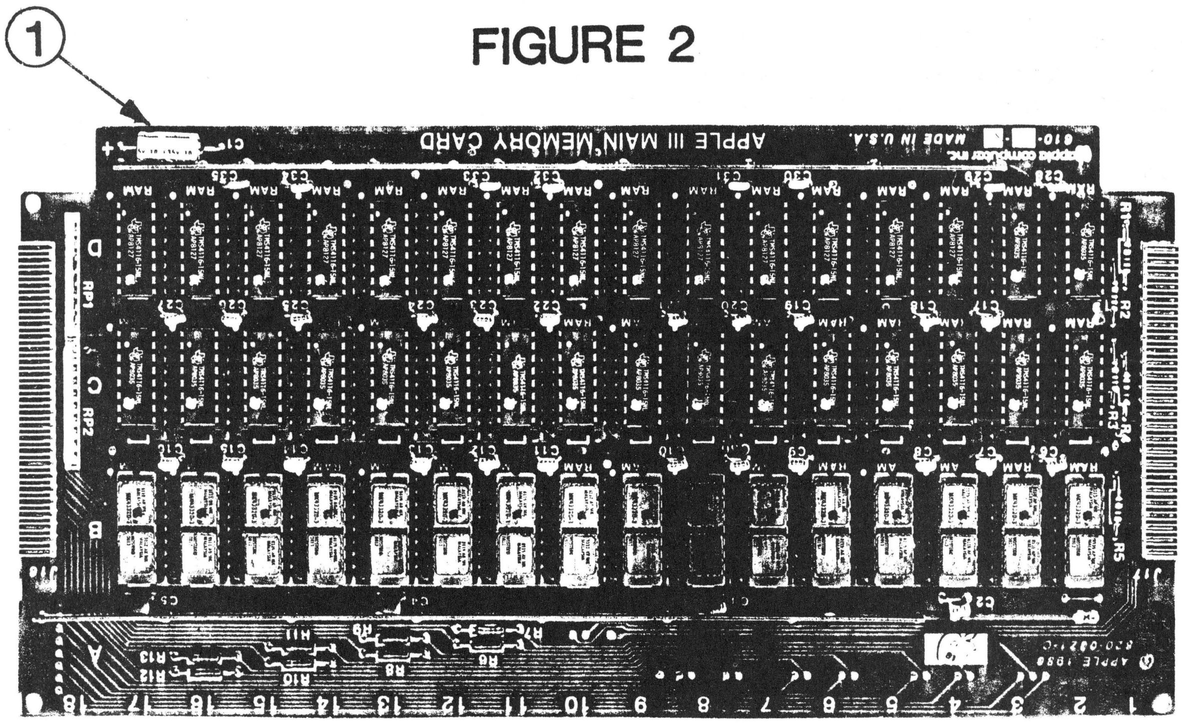
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FIGURE 1



5V MEMORY BOARD

FIGURE 2



12V MEMORY BOARD

A. DIAGNOSTICS SETUP

1. Determine whether the system under test has a 5-volt or a 12-volt memory board. (Early models of the Apple /// use a 12-volt memory board; later models use a 5-volt board. For the RAM tests (below, p.2.9), you need to know which style board is in the system under test.)

    a) Power down the Apple /// and remove the top cover.

    b) Look straight down through the main opening toward the front of the chassis. You will see the edge of the memory board projecting from under the keyboard, and on the left corner of the board you will see either a large grey ceramic resistor (5V board: Figure 1, #1), or a small blue tubular capacitor (12V board: Figure 2, #1).

    c) Write down which type board is in the Apple ///.

2. Replace the cover, and check to see that your Apple /// and associated peripherals are all properly connected.

3. Insert the diagnostics diskette into the internal disk drive and boot the system.

B. DIAGNOSTIC MENU

After you have successfully booted the diagnostic program, you will see the menu below displayed on the monitor screen.

```
            MAIN MENU

TEST ALL

VIDEO                    (NOT TESTED)
SOUND                    (NOT TESTED)
RAM TEST - 5V            (NOT TESTED)
DISK                     (NOT TESTED)
KEYBOARD                 (NOT TESTED)
ROM                      (NOT TESTED)

RAM TEST - 12V           (NOT TESTED)
MAKE TEST DISKS


PRESS:   UP/DOWN ARROWS TO SELECT TEST
         RETURN TO RUN TEST
PRESS:   ESC(APE) TO QUIT
```

NOTE: Because the Apple /// runs several internal diagnostics before booting, having come this far is a vote of confidence for correct system operation.

You will notice that TEST ALL is highlighted in inverse video. The inverse video indicates which test will be run when RETURN is pressed.

The UP/DOWN Arrows will move the inverse cursor line through the list of menu options one-by-one. Pressing RETURN will accept and run the highlighted menu option.

Pressing the ESCAPE key will exit the diagnostics program altogether.

C. MAKE TEST DISKS

In order to run the DISK TEST (below, p. 2.7), you must first make a test diskette for each disk drive in the system.

1. Press the Down Arrow several times until "MAKE TEST DISKS" is highlighted.

2. Accept this option by pressing the RETURN key.

3. Remove the diagnostic diskette from the internal drive.

4. When asked for the drive number for which you will create your test diskette, type a number which corresponds to the drive (1 = INTERNAL; 2, 3, and 4 = EXTERNAL) and press RETURN. If you have more than one drive, you must make a test diskette for each drive.

5. Insert a blank diskette into the internal drive. Close the door and press RETURN.

6. When the test diskette is complete, you will be asked if you want to make another test diskette. To create a test diskette for another drive type "Y", press RETURN, and follow the directions on the screen.

7. When finished, reinsert the Dealer Diagnostic Diskette into the internal drive and reboot the system.

Now you are ready to run the diagnostics on your Apple ///.

D. TEST ALL

Normally you should run all the tests when checking out a system. Accepting the TEST ALL option will cause all the tests on the menu (except the RAM - 12V test) to be run one-by-one as if they were selected one at a time.

1. Skip through the tests with the arrow keys until TEST ALL is highlighted.

2. Accept this option by pressing RETURN, and follow through the tests, referring to the notes below where necessary.

3. TEST ALL runs the RAM - 5V test automatically, but **not** the RAM - 12V test. If you are testing a system that has a 12V memory board, the RAM - 5V memory test will check the RAM. If no errors are encountered, the RAM on the 12V board is good. Should the RAM - 5V test fail, run the RAM - 12V test to get the proper location of the failed components. (See RAM - 5V and RAM - 12V TESTS, p. 2.9.)

4. If any errors are encountered, refer to the Apple /// Troubleshooting job aid to determine follow-up action.

E. VIDEO TESTS

The VIDEO diagnostic tests all the various screen and color modes available on the Apple ///. You will be presented with 13 different video displays and be asked to make a subjective evaluation of each one. After each display is presented, press:

SPACE BAR............................IF THE DISPLAY PASSES

RETURN KEY............................IF THE DISPLAY FAILS

ESCAPE KEY........................TO LEAVE THE VIDEO TESTS

LEFT ARROW KEY..........................TO RETRY THE TEST

NOTE: With a B&W monitor, different colors will be displayed as different shades of grey. Some B&W monitors are not capable of displaying all the different shades with a single setting of the monitor controls; in particular, parts of the AHIRES screens will be hard to see. You can adjust the brightness control on the back of the monitor to make the picture visible; you should not expect it to be perfectly clear on a B&W monitor.

You will find the chart describing your video display on the next page. The list is in the same order as the test.

WHAT YOU SEE

TEST DISPLAY	B&W MONITOR	COLOR MONITOR
HIRES MODE 1	B&W Pattern only	No Color
HIRES MODE 2	B&W Pattern only	No Color
280 x 192 COLOR HIRES MODE 1	Negative image	Red and Black
280 x 192 COLOR HIRES MODE 2	B&W Pattern	Green & White/ or Yellow
SUPER HIRES TEST 1	B&W Pattern only	No Color
SUPER HIRES TEST 2	B&W Pattern only	No Color
AHIRES TEST 1	Pattern divided into 4 different shades of grey.	From top to bottom, the pattern is colored: blue, green, & gold or orange.
AHIRES TEST 2	Pattern divided into 4 different shades of grey.	From top to bottom, the pattern is colored: blue, green, & gold or orange.
COLOR BAR & GREY SCALE TEST.	16 shades of grey from white on left to black on right--- may be difficult to resolve.	16 color shades, from left to right: white, aqua, yellow, green, pink, grey, orange, brown, light blue, medium blue, grey, dark green, light purple, dark blue, magenta and black.
APPLE II TEXT MODE 1	Sentence and Alphabet are displayed.	Same as B&W

TEST DISPLAY	B&W MONITOR	COLOR MONITOR
APPLE II TEXT MODE 2	large #2 is displayed.	same as B&W
APPLE /// 40 COLUMN TEXT MODE	16 blocks of different shades of grey, with color names printed in each box.	16 different colored blocks with the color names printed in each box.
APPLE /// 80 COLUMN TEXT MODE	smaller characters across 80 columns	same as B&W

F. SOUND TESTS

The SOUND diagnostic has 3 parts: a soft bell, a hard bell, and a sound that gradually grows in amplitude. After each sound, press:

SPACEBAR..............................IF YOU HEAR THE SOUND
or RETURN KEY.....................IF YOU DO NOT HEAR THE SOUND

G. DISK TEST

The DISK TEST tests the seek and the read-write functions of the disk drives. IT IS VERY SENSITIVE AND MAY FAIL A DRIVE THAT IS ACCEPTABLE AND USABLE. If a drive passes this test, you can be sure it is good. If it fails, see note at end of this section.

NOTE: Before running the DISK TEST you must have made test diskettes (see section C above).

1. Remove the dealer diagnostic diskette from the internal drive.
2. Insert the test disk that you created earlier. Close the drive door and press RETURN.
3. You will now be asked for the number of external drives. Type the number of external drives in the test system (i.e., do not count the internal drive) and then press RETURN.
4. The test will now run automatically, ending with a test summary, telling you which drives have passed or failed.
5. Remove the test diskette from the internal drive.
6. Reinsert the diagnostic diskette and press RETURN.

NOTE: IF A DRIVE FAILS THE DISK TEST, 1) TRY THE TEST AGAIN WITH A DIFFERENT TEST DISKETTE (a worn test disk can cause failure); 2) TEST THE D-SPEED USING THE APPLE][CALIBRATION OR DISK ALIGNMENT AID DISKETTE IN EMULATION MODE, AND ADJUST IF NECESSARY [SOS 1.3 has a narrow tolerance (+ or - 10), so get as close to 0 as possible]; THEN TRY THE DISK TEST AGAIN. IF THE DRIVE STILL FAILS, SEE THE APPLE /// TROUBLESHOOTING CHART.

H. KEYBOARD TESTS

The keyboard test is divided into 4 parts:

1. Alphanumeric Keys
2. Special Function Keys
3. Numeric Keypad Keys.
4. Keyboard Interrupt

NOTE: The steps below must be followed exactly or the test will fail.

1. Alphanumeric Keys:

   Every alphanumeric keystroke possible will be displayed on the screen. As you press the keys, their characters should disappear. Do not use the SHIFT key except where directed to, and press the SPACE bar last.

   a) Press the left SHIFT key and while holding it down press the 2 key.

   b) Press the right SHIFT key and while holding it down press the = key.

   c) Press the CONTROL key and while holding it down press the A key.

   d) Press all the remaining keys on the main keyboard except the SPACE bar. Each time a key is pressed, its character should disappear from the screen.

2. Numeric Keypad Keys:

   This test proceeds in the same manner as the Alphanumeric Key test, but for the keys on the numeric keypad.

   After you have removed all of the keys displayed on the monitor, you will automatically go to the Special Function Keys test. Notice that you can abort this test at any time by pressing ESCAPE.

3. Special Function Keys:

   a) After the special function keys appear press the ALPHA LOCK key once. This will test the ALPHA LOCK key.

   b) The diagnostic will then ask you to press the SPACE BAR and to hold it down. This is to test the slow repeat function. Don't release the SPACE BAR: to complete the next step you must still be holding the SPACE BAR down.

CONTINUED ON NEXT PAGE

c) Next, you will be asked to press the OPEN APPLE key and SOLID APPLE key down simultaneously. This tests both the OPEN APPLE key and the fast repeat function.

d) Now release all the keys; then press first the SOLID APPLE key and then the SPACE BAR. This is to test the repeat inhibit function.

4. Keyboard Interrupt Test:

When the keyboard interrupt test comes up on the screen simply press any key to continue. The diagnostic will inform you of the keyboard status and then return to the main menu.

J. ROM TEST

The system takes over and you will see one of two messages:

ROM PASSES . . . or ROM FAILS . . .

NOTE: If you selected the TEST ALL option from the main menu, you will be returned to the menu after the ROM test. The test results will be displayed to the right of each test option.

K. RAM - 5V and RAM - 12V TESTS

If you use the TEST ALL option, the system will automatically run the 5V test, and if it reports no errors, you can be confident that all RAM are good, no matter which style of board is installed in the Apple ///. If it reports failures, however, you must run the RAM - 12V test in order to obtain the correct locations of failed RAM.

The instructions for both tests are the same (except for reading the failure messages). Read through the steps below, and then run the test.

1. Get the memory size from the bottom of the Apple /// where the serial number is located.

2. Select either the RAM - 5V or the RAM - 12V test, depending on the style of memory board in your Apple (see Section A above, p. 2.3), and press RETURN to begin the test.

CONTINUED ON NEXT PAGE

3. The test will now attempt to determine the size of memory in the system. There are three possible outcomes:

   a) A screen will appear with the correct memory size.

      (1) Press the SPACE bar and the RAM test will start.

   b) A screen will appear with the wrong memory size.

      (1) Press the RETURN key, and

      (2) A screen will appear and ask you for the correct memory size.

      (3) Type the letter that corresponds to the correct memory size.

      (4) The first screen will reappear with the newly selected memory size. If this is correct, press the SPACE bar and the test will start. If the memory size is not correct, press the RETURN key and the second screen will reappear so that you may reselect the correct memory size.

   c) The test will not be able to determine the size of memory by itself, so a screen will appear and ask you for the correct memory size.

      (1) Select the letter that corresponds to the correct memory size.

      (2) A screen will appear with the selected memory size. If this is correct, press the SPACE bar and the test will start. If the memory size is not correct, press the RETURN key and the second screen will reappear so that you may reselect the correct memory size.

4. The test will then check the RAM and report any failures. The 12V test gives RAM locations according to a grid of letters and numbers printed along the side and top of the 12V board (rows B, C, D; columns 2 through 17: see Figure 3).

   The 5V test gives RAM numbers (U1 through U32). On early versions of the 5V board, these U-numbers were printed next to the RAM locations on the board; on later 5V boards, the U-numbers are no longer printed: to locate U-numbers on those boards, use Figure 4.

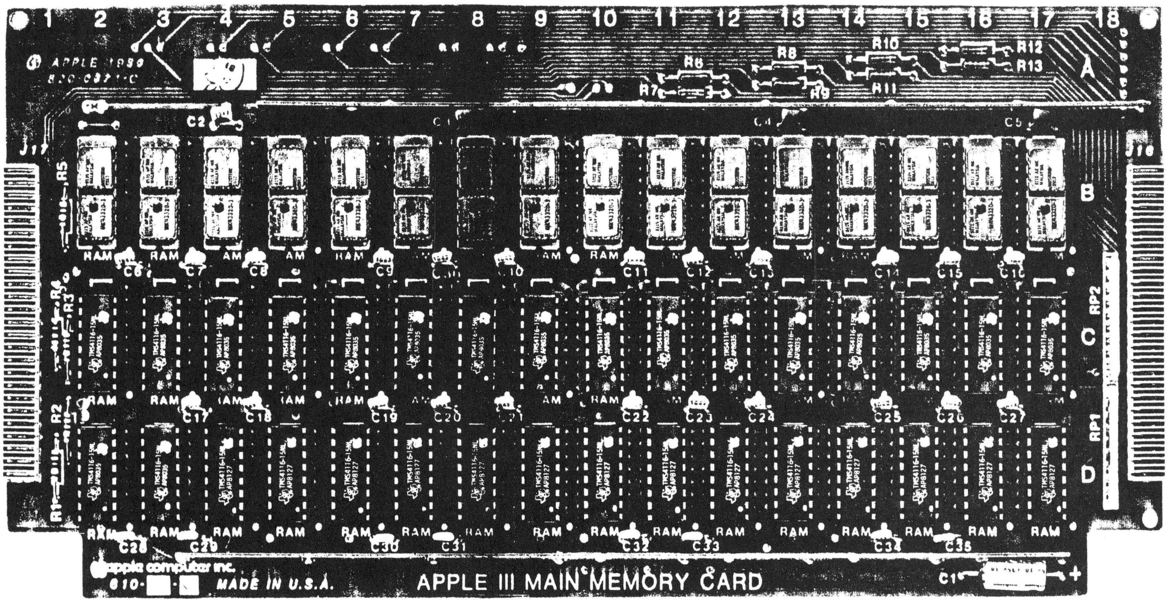


FIGURE 3 — 12V BOARD

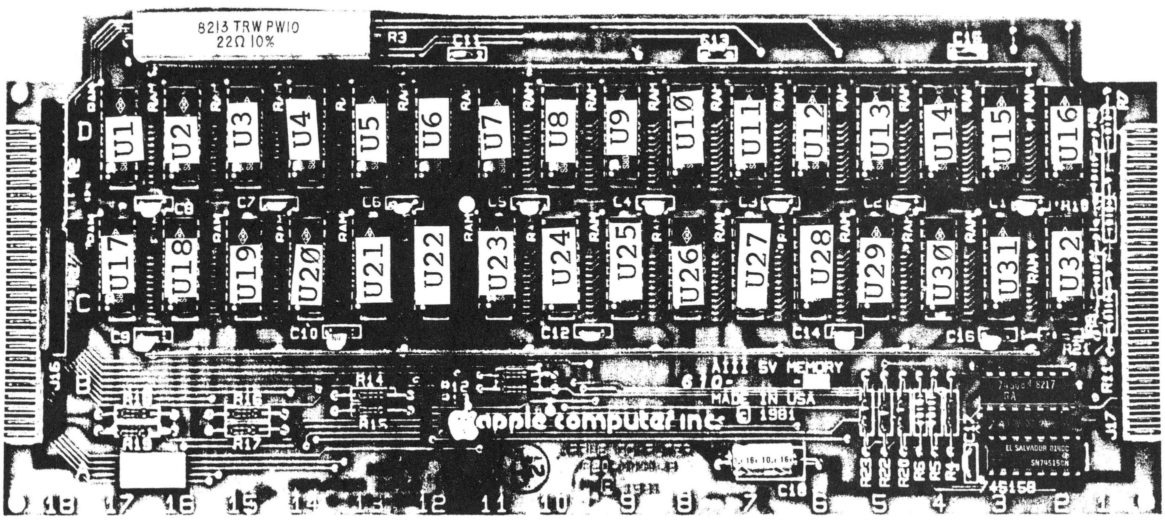


FIGURE 4 — 5V BOARD

Apple /// Technical Procedures

Section 3

Troubleshooting

Contents:

A. USING THE DIAGNOSTIC FLOWCHART

1. The flowchart is made up of numbered and lettered boxes. The numbered boxes contain directions for proceeding through the flowchart based on the symptoms that show up on the Apple ///.

2. The lettered boxes contain a list of numbers. Each number refers to one of the 11 steps.

3. Always begin troubleshooting at Box 1 of the flowchart, "Power on with the SOS System Demonstration diskette." When the Apple ///'s symptoms lead you through the flowchart to a lettered box containing a list of troubleshooting steps, follow the instructions below:

   a. Turn the power off.

   b. Carry out the designated troubleshooting step. (Start at the top of the list of numbered steps.)

4. When a troubleshooting step leads you to open the Apple ///, you should:

   a. Check to make sure all connecting cables are properly hooked up.

   b. Check all boards to make sure all IC chips are properly seated.

   c. Power on to see if the problem is eliminated.

      (1) If the problem IS NOT eliminated:

         (a) Turn the power off.

         (b) Replace whatever spare module you just put into the Apple /// with original.

         (c) Carry out the next troubleshooting step listed in the lettered box.

         (d) Go back to Step 4c above.

      (2) If the problem IS eliminated:

         (a) Leave the swapped module in place and continue through the Diagnostic Flowchart.

         (b) Take the "bad" module and prepare it for shipment to your Level II Service Center.

5. The Diagnostic Flowchart is designed to test only the basic Apple /// system. Disconnect any peripheral devices and cards and troubleshoot them separately according to the procedures explained in the appropriate Level 1 Service Training module.

6. Each swap step involves exchanging a known good part from your spares kit with the questionable part from the Apple ///.

   a. When swapping, first just connect the cable(s) to the new module so you can see if the swap fixes things or not.

   b. Don't fully install the new module and screw everything down--if the new module doesn't solve the problem you'll just have to take it out again.

B. STEPS REFERRED TO IN THE LETTERED BOXES OF THE FLOWCHART

1. Swap the appropriate connecting cable.
   V = Video cable (if available)
   PS = Power Supply cable
   DD = Disk Drive cable
   KB = Keyboard cable

   NOTE: The keyboard and disk drive cables are identical to each other. Your Spares Kit may only list the DD cable, but you can use it whenever you need to swap the KB cable.

2. Swap the power supply.

   a. Check the power supply fuse first; swap it if it's burned out.

3. Swap the drive.

   a. If the drive proves to be the problem, take the problem drive and further isolate the defective module down to the analog card or mechanical assembly:

      (1) Swap the analog card.

         (a) Take the analog card of the "bad drive", put it in the good drive, and power on again. If the drive does not work you know the problem with the "bad drive" is with the analog card. If the drive does work you know the "bad drive" is with the mechanical assembly.

         (b) If the mechanical assembly proves to be the problem it may just be an adjustment problem. You can run the disk tests for the Apple II in emulation mode on the /// and make any necessary adjustments to see if they eliminate the problem.

4. Swap the main logic board.

5. Swap the keyboard.

6. Swap the RAM memory board. (You may have to reload the new board with the RAM from the original board.)

7. Try booting again.

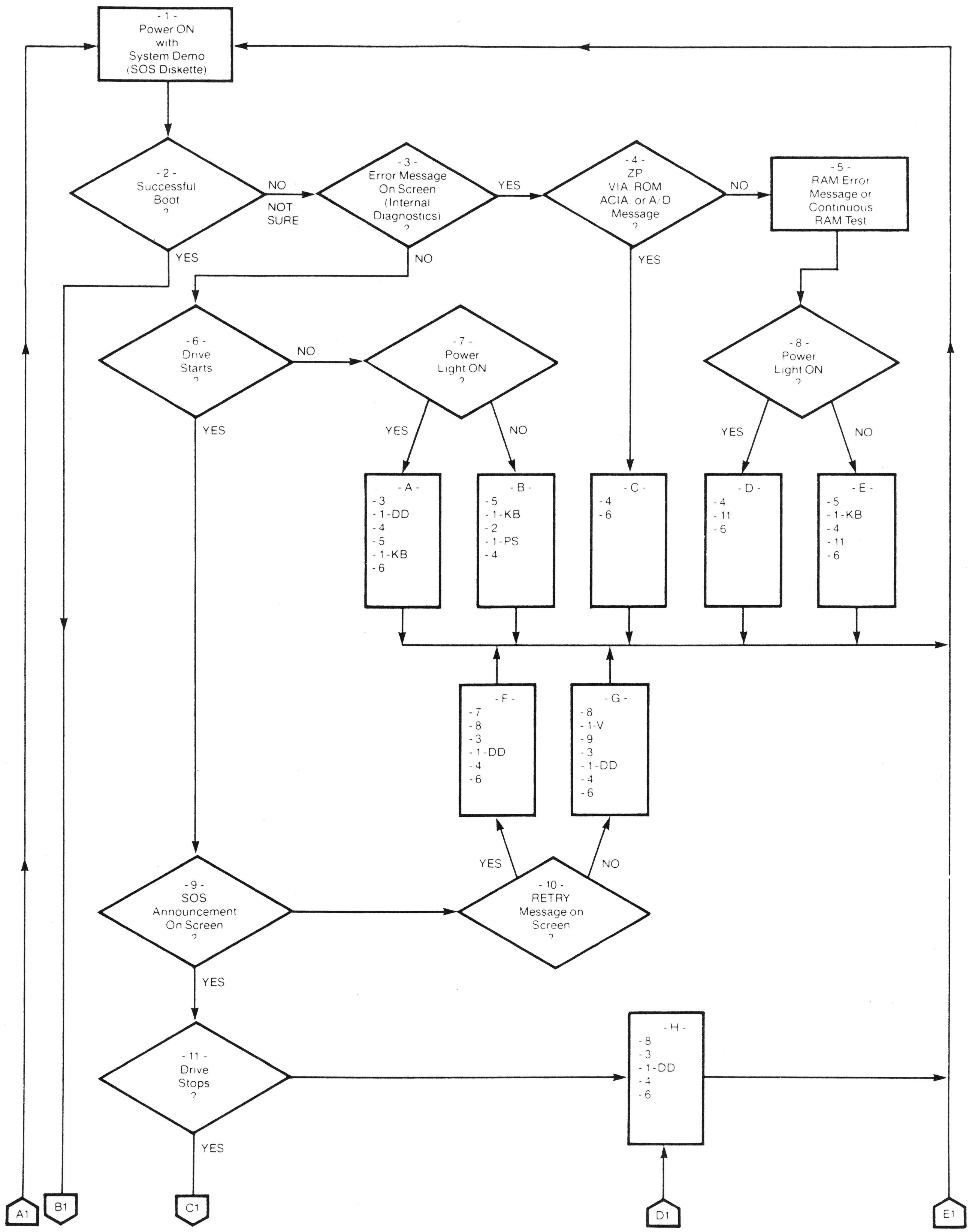
8. Try booting a different SOS diskette.

9. Swap the video monitor.

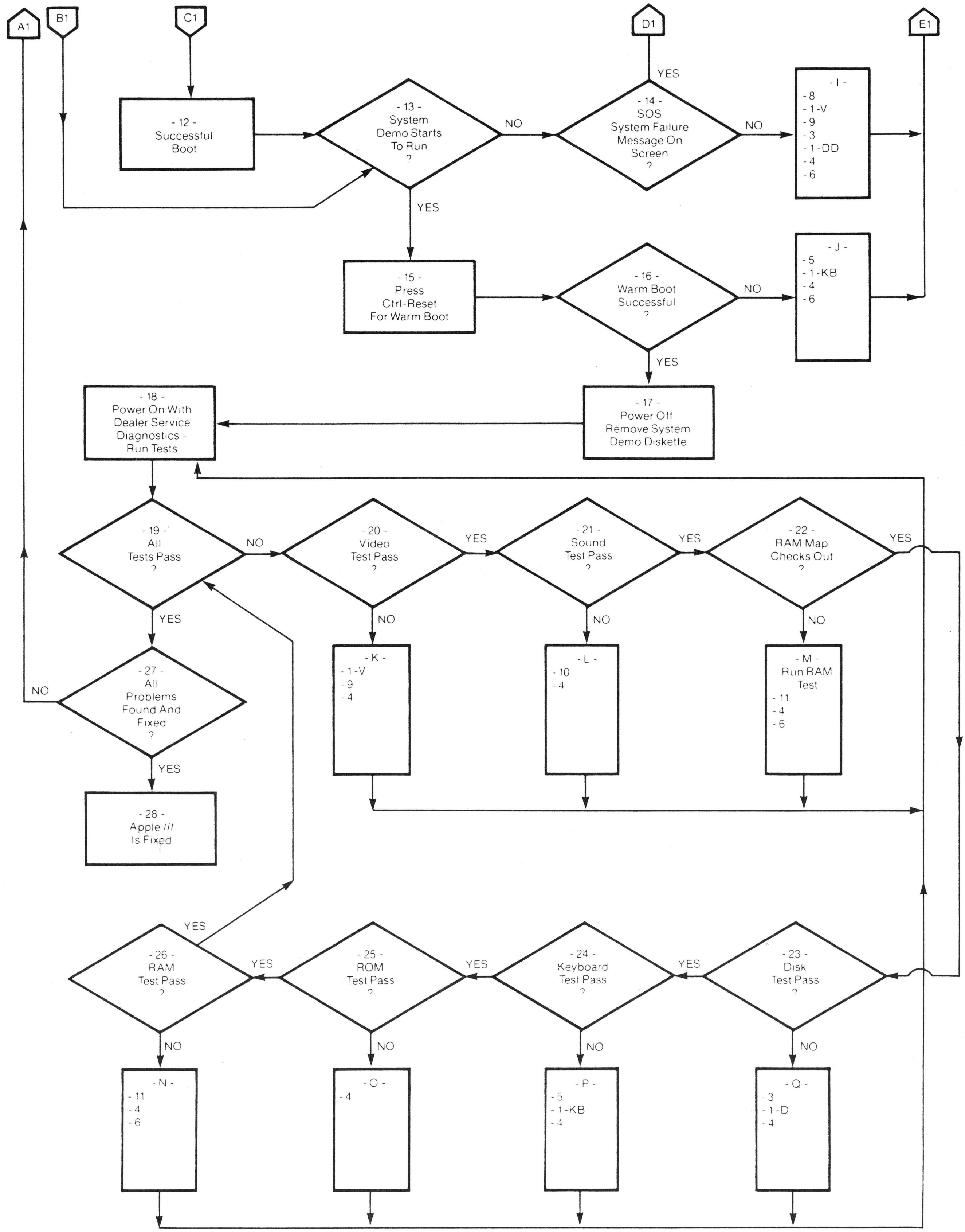
10. Swap the speaker.

11. Swap the designated RAM IC chips. (Refer to the Apple /// Diagnostics - Section 2, RAM - 5V TEST and RAM - 12V TEST.)

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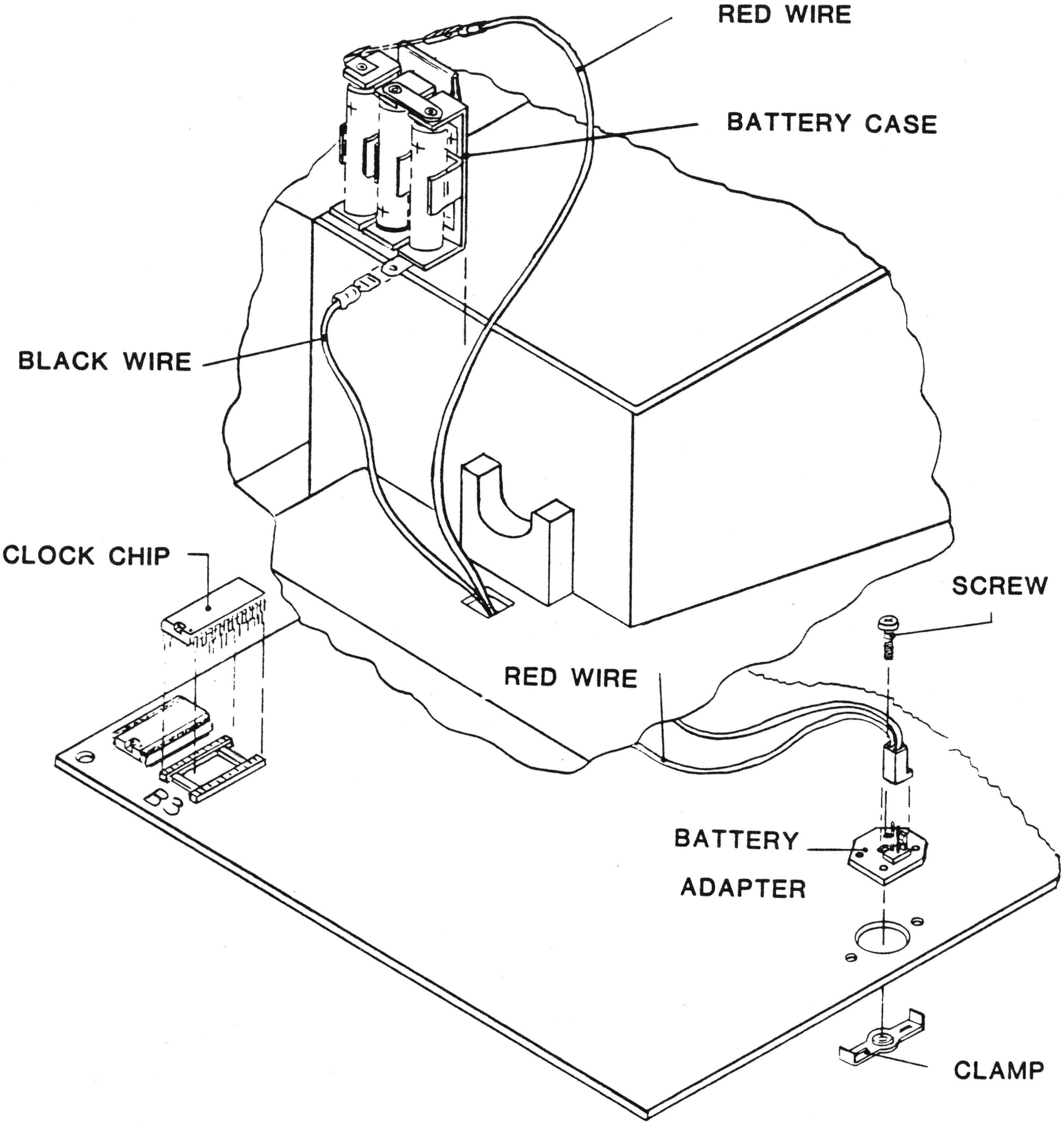
Apple /// Technical Procedures

Section 4

Modifications

Contents:

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NECESSARY TOOLS:

#1 and #2 Phillips Screwdriver
Apple /// System Utilities diskette
Apple /// clock kit
Apple /// Clock Calibration diskette

INSTALLING THE APPLE /// CLOCK KIT

1. Remove the Apple /// Main Logic Board and Top Cover. For instructions on removing the Main Logic Board refer to page 1.15 of the Apple /// Technical Procedures.

2. Place the Main Logic Board on a flat surface in front of you so that the empty socket at B3 is located to your left. Insert the Clock Chip into the empty socket with the notch on top of the the chip facing toward the front as shown in figure 1.

3. Lift the Main Logic Board gently and place the clamp through the two holes on the middle right-hand side of the Main Logic Board has shown in figure 1. Retain the clamp in place with your finger.

4. Place the battery adapter PCB over the large hole with the long flat side of the battery adapter PCB toward the right-hand edge of the Main Logic Board as shown in Figure 1. The battery adapter PCB should be seated between the legs of the clamp.

5. Insert the screw through the middle of the battery adapter and then tighten the screw until the battery adapter PCB is snug against the Main Logic Board.

6. Install 3 "AA" Alkaline batteries into the battery pack as labeled in figure 1, and on the battery pack. Now attach the lugs of the red and black wires of the battery cable to the battery case. Observe the proper polarity as shown in figure 1.

7. Turn the Apple /// right-side up. Clip the battery case on to the lip of the casting to the left of the speaker. Run the molex connector end of the battery cable down through the hole below the speaker on the Apple /// as shown in figure 1.

8. Reinstall the Main Logic Board. Be sure to connect the female end of the lug connector to the male end on the battery adapter PCB, now attached to the Main Logic Board.

9. Make all of the necessary connections to the Main Logic Board and reinstall back to the Apple /// case. Replace the Apple /// cover.

SETTING THE APPLE /// CLOCK

In order to calibrate the Apple /// clock, the clock time must be set close to the exact second so the number of seconds lost or gained can be determined.

NOTE: To prevent confusion, any text that is to be entered into the computer is enclosed by curly-brackets {}. Type everything, including punctuation, between them; but don't type the curly brackets themselves.

EXAMPLE: If you are supposed to type 1-2-3-4, it will appear in the text as {1234}.

1. Boot the Utilities diskette and select {D}, Device handling commands.
2. Select {T} from the Devices Menu, set time and date.
3. The cursor should now be in the lower portion of the screen that says, "Set the date to: [ ]".
4. Type in the date in the format: {day <SPACE> month <SPACE> year}, where the month can either be the numerical representation or a three letter abbreviation and then press <RETURN>.

   If the date is January 1, 1982 it can be typed in as: {1 Jan 82} or {1 1 82}.
5. Find out what the correct time is. You can do that be calling the local time on the telephone.
6. The cursor should be in the box that says, "Set the time to: [ ]".
7. Listen to the time on the telephone: you should hear the hour-minute and the upcoming ten second mark and then a beep.
8. Type in the time including the seconds which will represent the upcoming beep in the format: {hour:minute:second <SPACE> Xm}.

   If the upcoming beep will be 4:10:00 pm, you may enter the time as {4:10:00 pm}, {16:10:00} or {04:10:00 pm}.
9. When you hear the tone, press <RETURN>.
10. Verify that the beeps occur at the same time as the seconds change on the Utilities time display in the upper right hand corner on the monitor.
11. Repeat steps 6 thru 9 until the beeps are approximately concurrent with the seconds displayed on the monitor.

ADJUSTING THE APPLE /// CLOCK SPEED

The Apple /// clock is calibrated by comparing the Apple /// System clock to the one second intervals at the clock chip. In order to calibrate the clock within reasonable accuracy, without the the use of very expensive clock calibration equipment, a 24 - 48 hour observation period is required.

1. Disconnect all connections on the back of the Apple ///.

2. Turn the Apple /// over and remove the 5 screws that fasten the beige Keyboard cover to the case.

3. Remove the keyboard cover, then turn the Apple /// rightside up and remove the 4 screws that hold the keyboard in place.

4. Connect the power cord and the video cable and boot the Apple /// Clock Calibration Program.

5. Select the 10 Second interval by pressing down the <ALPHA LOCK> key.

6. Lift the keyboard up and lay it carefully against the sloped Apple /// front cover.

7. Wait until the speaker clicks twice (20 seconds) and note the value of the indicated number. The number should read +560; +/- 9.

8. If the indicated number is not within the range indicated in step #7, adjust the trimmer capacitor located in the center of the keyboard with a small screwdriver. When you adjust the trimmer pot, the number will not change right away; it takes 10 seconds to update. Turn the trimmer capacitor clockwise to increase the value and counterclockwise to decrease the value.

9. Wait until speaker clicks at least twice to insure that the indicated number remains constant.

10. Repeat steps 7 thru 9 until the indicated number is between 551 and 569. (+560 +/-9) Once the number has been set it may vary slightly.

11. Record the indicated number of the Apple /// Calibration Program on the piece of paper and attached to the front of the Apple ///.

12. After a 24 hour observation period, boot the Utilities diskette and press {D}.

13. Find out what the correct time is. You can do that be calling the local time on the telephone.

14. Note the difference between the ten second beeps on the telephone and the seconds on the Apple /// clock in the upper-right hand corner of the monitor.

15. Record the time difference to the closest 1/2 second on paper.

16. If the observation period has been longer or shorter than 24 hours calculate the number of 24 hour periods by dividing the observation period by 24. Let's walk through an example.

    Suppose an Apple /// clock has been running for 28 hours and has gained 5 seconds. The current value of the Apple /// Clock Calibration Program is +780.

    Observation period in hours ÷ 24 = Number of 24 hour periods

    28 ÷ 24 = 1.16 (24 hour periods)

17. Calculate the time difference in seconds per 24 hour period by dividing the time difference recorded in step #14 by the Number of 24 hour periods .

    Time Difference -- Number of 24 hour periods = Time Difference in seconds per 24 hour period.

    5 ÷ 1.16 = 4.31 seconds difference per 24 hour period.

18. Calculate the Clock Offset by multiplying the Number of seconds per 24 hour period by 118.

    Time Difference in seconds per 24 hour period X 118 = Clock Offset

    4.31 X 118 = 508.58

19. Calculate the new Apple /// Clock Calibration value by adding or subtracting the clock offset. If the clock is gaining time, the offset value is subtracted from the Apple /// Clock Calibration Value. If the clock is losing time, the offset value is added to the Apple /// Clock Calibration Value.

    Since the clock is gaining time we subtract from the old value:

    780 (old value) - 508.85 (offset) = 271.15 (new value)

20. Adjust the Apple /// Clock Calibration Program Value to the new value found in step 19, following the procedure in steps 7 through 9.

EXAMPLE 2

An Apple /// clock has been running for 34 hours and lost 2 seconds. The value of the Apple /// Clock Calibration Program value is +480. What value should the Apple /// Clock Calibration Program indicate after adjustment?

1. Number of 24 hour increments: 34/24 = 1.42

2. Number of seconds per 24 hour period: 2 X 1.42 = 2.84

3. Clock offset: 1.41 X 118 = 292.64

4. New Calibration Program value: 480 + 293 = 773

Apple IIe

TABLE OF CONTENTS

Section 1

Take-apart

Contents:

Note: Different versions (revisions) of the motherboard are mounted in different ways to the base. This module will show you only one mounting, but it should be easy to adjust to the others. All other instructions apply to all revisions of the motherboard.

There are also differences between the backplates. The later Apple //e´s do not require clamps for the disk drive cables or nutplates for the DB connectors.

For these procedures you will need:

Phillips head screwdriver
Flat blade screwdriver
Wrench (p/n 919-0007)

A. OPENING THE CASE

1. Power down and disconnect the power cord.
2. Remove Apple lid.
3. Touch the power supply to release any static build-up.

B. REMOVING AND REPLACING PERIPHERAL CARDS AND DISK DRIVE CABLES

REMOVING PERIPHERAL CARDS AND DISK DRIVE CABLES

1. Remove the disk interface card from slot 6.
2. Unplug the disk drive cable connectors from the interface card.
3. To remove the disk drive cable from the back panel, remove the two Jack screws from the clamp (See Figure 1), slide the cable out of the clamp (See Figure 2), and pull the cable out of the opening in the back panel.

FIGURE 1

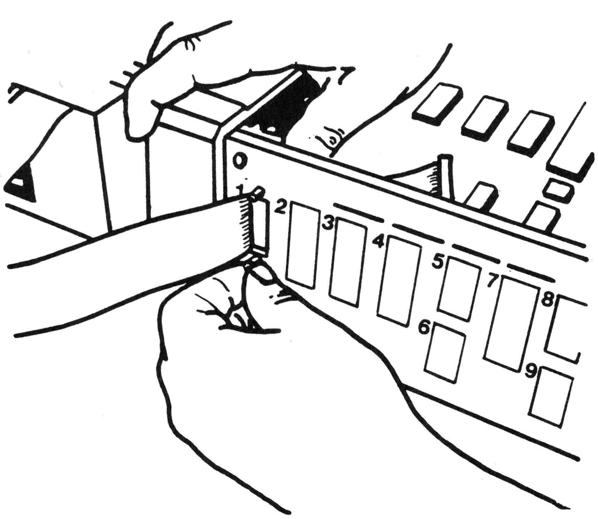
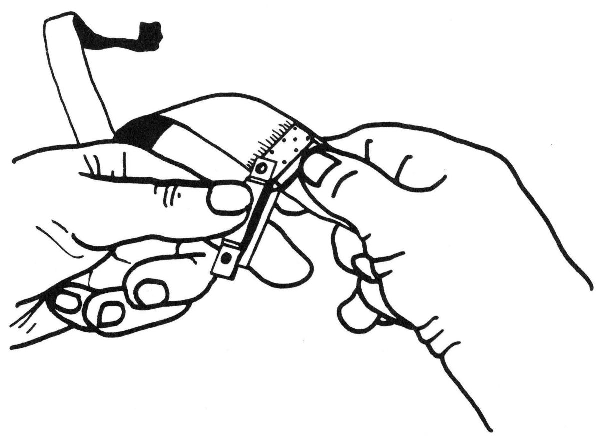


FIGURE 2



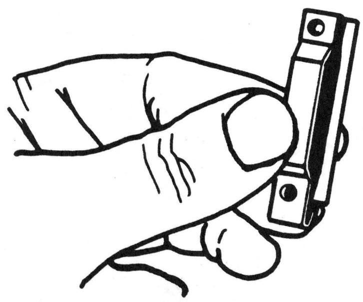
REPLACE DISK DRIVES CABLES

1. Slide the disk drive´s cable through the lowest numbered opening of the back of panel.

2. Take hold of the cable and bend the flap away from the connector. Hold the flap against the cable with your thumb.

3. Hold the clamp in your other hand so the side with the raised section is under your thumb and the opening in the clamp is pointing up (See Figure 3).

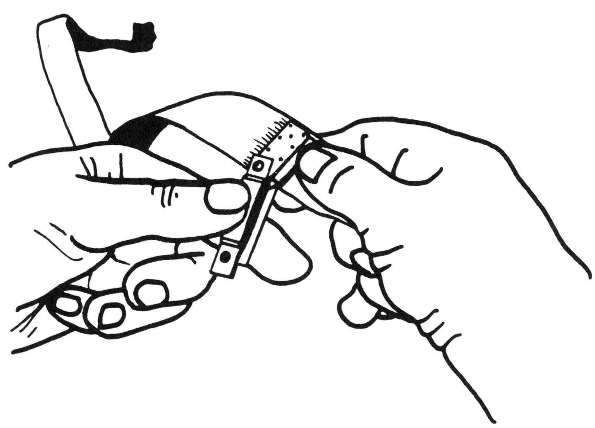
FIGURE 3



4. Slide the cable and folded over metal flap into the clamp so that the flap is pressed against the cable and sandwiched between the two sides of the clamp (See Figure 4).

   NOTE: You may have to spread the clamp open slightly to make room for the flap.

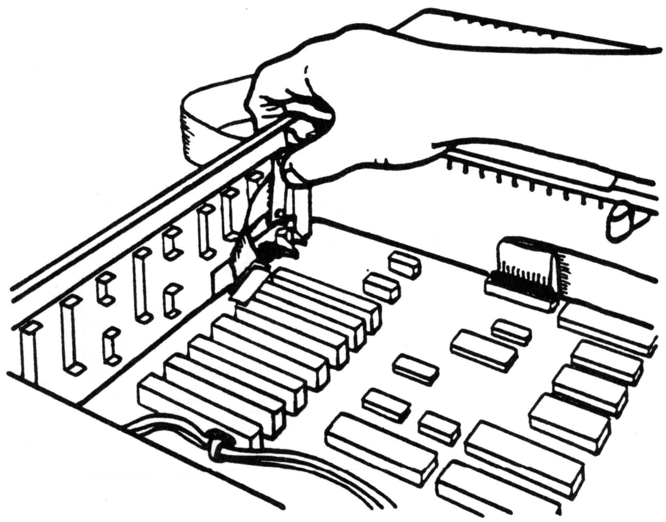
FIGURE 4



5. Feed the cable back through the opening until the clamp touches the back panel. Push the clamp against the back panel so that the raised section fills the opening and the two round nuts that are affixed to the clamp are facing you (See Figure 5).

NOTE: In order to arrange the clamp so it´s flat against the back panel, you may have to bend the cable into an "L" shape at the drive side of the clamp.

FIGURE 5



6. Hold the clamp against the opening with one hand. Reach behind the computer with the other hand and install the two screws through the two slots on the top and bottom of the opening and into the nuts on the clamp.

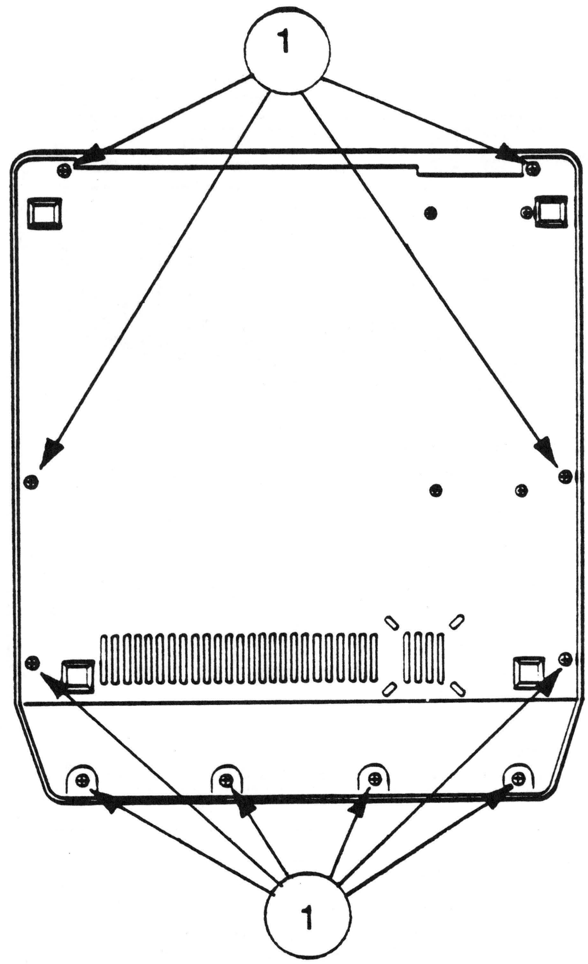
C. REMOVING AND REPLACING THE HOUSING

1. Open the case (Section A, p.1.2) and remove the peripheral cards and disk drive cables (Section B, p.1.2).

2. Turn the Apple upside down resting the keyboard on a protective pad.

3. Remove the ten round head screws from the periphery of the base (See Figure 6, #1).

FIGURE 6

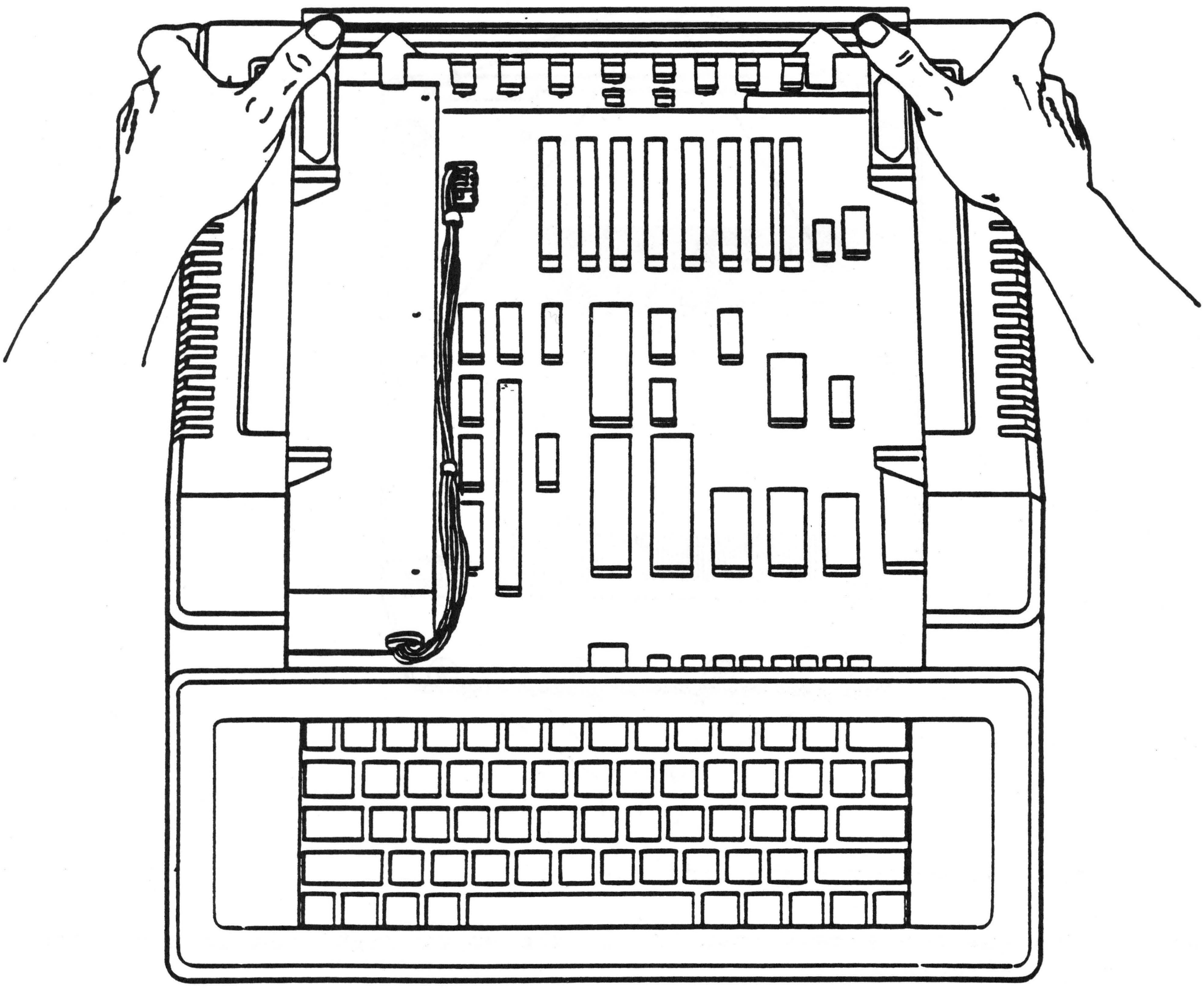


4. Turn the computer right side up.

5. Remove the two screws that are in the upper right and left corners of the back panel.

6. To free the housing push back on the thin metal back plate until is is free from the horizontal bar which is part of the housing (See Figure 7, #1). Gently lift the housing off the base.

FIGURE 7



REPLACING THE HOUSING

1. Slide the housing over the base. Flex the back metal plate backwards to ease it over the back plastic bar of the housing.

   NOTE: Be sure the keyboard cable remains in the box, is properly folded, and is lying flush against the outside of the keyboard stand.

   NOTE: Be sure the keyboard sits freely in the housing. In particular, check the reset key to see that it does not stick after it has been pressed down.

2. Turn the computer upside down, resting the keyboard on the protective pad.

3. Replace the ten screws that attach the housing to the base.

   NOTE: When replacing the screws put in all of them partway, and then, starting from front to back, secure them tightly.

4. Turn the computer right side up.

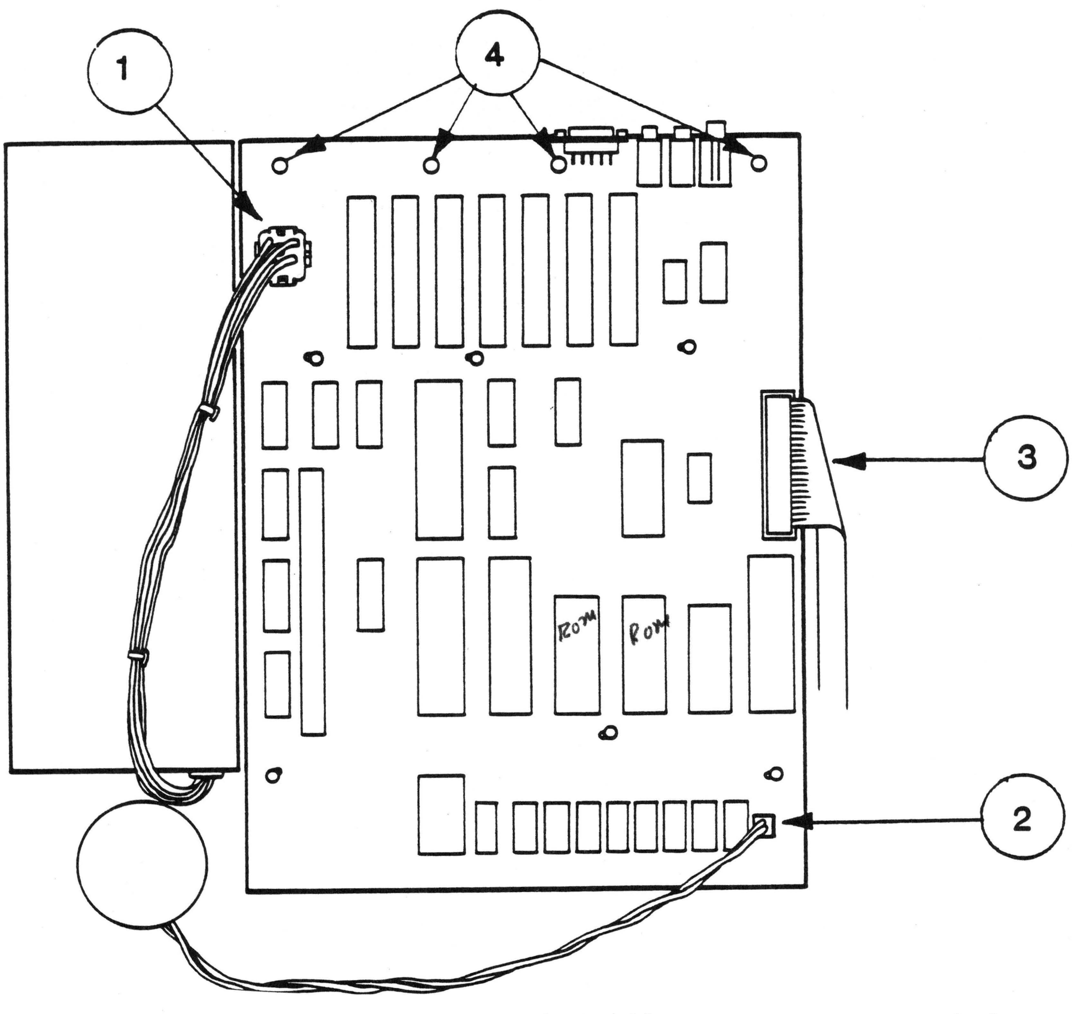
5. Replace the two screws in the upper left and right corners of the back panel.

D. REMOVING AND REPLACING THE MOTHERBOARD

REMOVING THE MOTHERBOARD

1. Remove the housing from the Apple, (Section C, p.1.5).
2. Pinch the left and right sides of the power supply plug and pull the plug from the top of the motherboard. (See Figure 8, #1).
3. Unplug the speaker connector. (See Figure 8, #2).
4. Remove the keyboard cable. (See Figure 8, #3).
5. Remove the four screws across the back of the motherboard. (See Figure 8, #4).
6. Using a flat blade screwdriver push in on the flanges of the six stand-offs: three across the middle and three toward the front of the motherboard.
7. Carefully lift the board up and out.

FIGURE 8



REPLACING THE MOTHERBOARD

1. Place the motherboard over the six stand-offs and press the board down into place.

2. Replace the four screws across the back of the motherboard.

3. Plug in the speaker connector.

4. Plug in the power supply.

5. Plug in the keyboard cable.

E. REMOVING AND REPLACING THE KEYBOARD

REMOVING THE KEYBOARD

1. Remove the housing from the Apple (Section C, p.1.5).

2. Remove the four phillips head screws which hold the keyboard in place on the keyboard stand.

3. Lift the keyboard free.

REPLACING THE KEYBOARD

1. Place the keyboard on the keyboard stand.

2. Replace the four screws to attach the keyboard to the stand.

F. REMOVING AND REPLACING THE POWER SUPPLY

REMOVING THE POWER SUPPLY

1. Remove the housing (Section C, p.1.5).

2. Remove the motherboard (Section D, p.1.7).

3. Remove the keyboard (Section E, p.1.7).

4. Set the base on its side.

5. While steadying the base and power supply with one hand remove the remaining four screws with lock washers from the base.

6. Remove base from power supply.

REPLACING THE POWER SUPPLY

1. Align power supply with base.

2. Replace the four round head screws with washers.

3. Turn the base right side up.

Apple //e Technical Procedures

Section 2

Diagnostics

Contents:

INTRODUCTION

The Apple //e Diagnostic ROM is a troubleshooting aid for the Apple //e. This job aid briefly covers its content and use.

To use the Diagnostic ROM, insert it in any slot. Set the red switch on the ROM so it slants away from the keyboard. On power-up it will boot and automatically proceed to the menu (see below). If the Diagnostic ROM does not boot check the switch to see if it is slanting away from the keyboard.

Rom Card

```
          Apple //e Diagnostics
          1982 Apple Computer

          Enter the Letter of
           the Desired Test

       <P>  PROCESSOR TEST
       <R>  READ ONLY MEMORY TEST
       <M>  RANDOM ACCESS MEMORY TEST
       <C>  CHARACTER SET TEST
       <K>  KEYBOARD TEST
       <V>  VIDEO TESTS
       <L>  LOOP ROM RAM AND PROCESSOR TESTS
       <S>  SPEAKER TEST


        SPACE BAR TO RETURN TO MENU

        MICROPROCESSOR IS OK

        ROM AT MOTHERBOARD LOCATION D8 IS OK

        ROM AT MOTHER BOARD LOCATION D10 IS OK
```

To run a test enter the letter of the desired test. To exit a test and return to the menu the general rule is to press the SPACE BAR.

PROCESSOR AND READ ONLY MEMORY TESTS

The Processor and Read Only Memory Tests are executed on powering up the system with the ROM installed. Messages regarding the integrity of the microprocessor and the ROMs are displayed on the last few lines of the menu screen.

Selecting "P" or "R" from the menu will retest the processor and memory. The menu screen is replotted when the test is initiated from the menu screen.

RANDOM ACCESS MEMORY TEST

Each RAM on the motherboard is tested.

The screen clears and alternates three times between two graphics pages and then the screen alternates three times between a graphics page and a blank page.

    CURRENTLY TESTING MEMORY AT $D000-$FFFF

is painted at the top of an otherwise blank screen. The screen then clears and the menu reappears.

If an error is detected a message is displayed in the same format as the following:

    SUSPECTED FAILURE AT LOCATION F13
    SPACE BAR TO RETURN TO MENU

The probable motherboard location of the failed RAM in this example is F13. If no errors are found the test returns to the menu screen.

CHARACTER SET TEST

The Character Set Test is largely self explanatory. Four sets of characters are displayed with the line above them describing how they should look.

Note: The characters are in the same order in each set to make it easy to spot a missing or incorrect character.

Failure Indications: If the characters are not as described something is probably wrong with the character set ROM.

Press SPACE BAR to return to the menu.

KEYBOARD TEST

The instructions for operating the Keyboard Test are displayed on the screen upon selection of that option.

The keyboard is represented on the screen. If the characters displayed on the screen do not match those on the keyboard the character Generator IC is probably bad.

You must press each key to test it. As you press the key the corresponding character on the screen will disappear. When you have tested each key (the characters are gone from the screen) press CONTROL-C to return to the menu.

Note:

1. The shift or CAPS key must be depressed to test the alphabetic characters. If you fail to do so the CAPS LOCK key on the lower left of the keyboard representation will flash.
2. The SHIFT and CAPS LOCK keys do not disappear.
3. The tilde "~" and question mark "?" disappear when typed in conjunction with the SHIFT key.

Failure Indications: Keys that bounce will sound an alarm and be highlighted in inverse video. If all or none of the characters cannot be made to disappear from the screen, the key switch of that character's key or the Encoder ROM might be at fault.

Press CONTROL-C to return to the menu after completing the test.

VIDEO TESTS

Both the high and low resolution graphics of the monitor are tested by video tests.

The "lores" (low resolution) test alternates between two identical "lores" graphic pages that have different messages on the bottom of the screen. The graphics should remain constant regardless of the displayed message.

Press SPACE BAR to continue to the "hires" (high resolution) test. The two "hires" pages should be identical except for the "1" or "2" alternating in the upper left corner of the grid.

Failure Indications: Any difference between the two pages would indicate a failure either in RAM or the display mechanism of the high or low resolution graphics.

Press SPACE BAR to proceed from one test to another and to return to the menu from the second test.

LOOP ROM RAM AND PROCESSOR TESTS

This test is a continuous successive execution of the first three tests listed on the menu.

It is useful in finding intermittent ROM, RAM, and processor problems.

Press SPACE BAR to return to the main menu.

SPEAKER TEST

The speaker test does what is says it does. That is, it plays five tones incrementing from low to high. If this does not occur the failure is in either the speaker or the motherboard.

Disk II

DISK][TECHNICAL PROCEDURES

TABLE OF CONTENTS

Disk][Technical Procedures

Section 1

Take-apart

Contents:

A. REMOVING THE DISK DRIVE COVER

1. Power off the system.

2. Remove the Apple lid.

3. Unplug the disk interface card and lay it gently to one side.

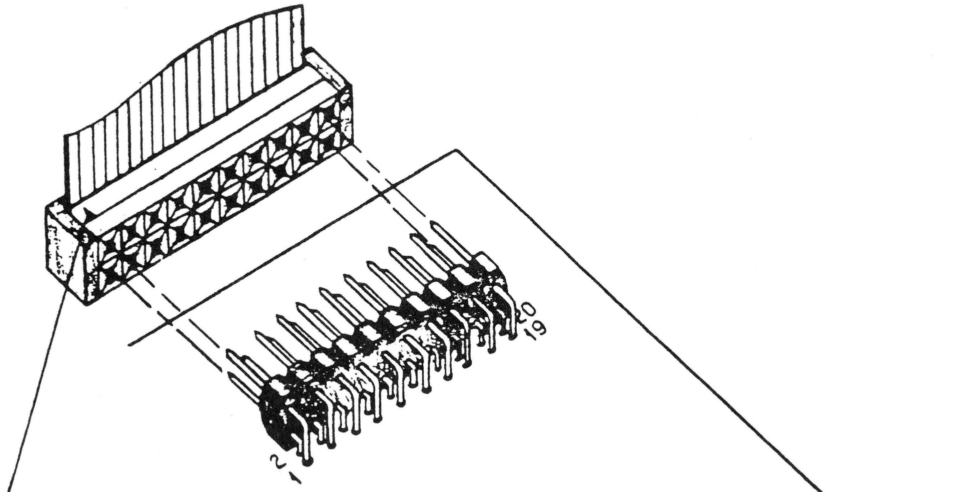
4. Close the disk drive door.

5. Turn the drive upside down and remove the four screws.

6. Set the door end of the unit down on a protective pad.

7. Slide the cover up until it clears the interior parts of the drive. Set cover aside and set the unit down on its base again.

   NOTE: If the vent covers (inside the housing) get caught on the frame while you are removing the cover, gently pry them away from the frame while continuing removal. After removal, smooth out any tear or bubble in the covers.



ARROW SHOULD BE UP WHEN CONNECTOR IS INSTALLED.

YOU CAN PERMANENTLY DAMAGE THE DISK DRIVE IF YOU ATTACH THE CABLE INCORRECTLY. HERE IS HOW TO DO IT RIGHT:

1. THE CABLE LEAVES THE CONNECTOR ON THE SIDE **AWAY** FROM THE CARD.

2. MAKE SURE **ALL** PINS GO INTO THEIR MATCHING HOLES.

FIGURE 1

B. REPLACING THE DISK DRIVE CABLE

Removing the Cable:

1. Power down the Apple. Remove the disk drive cover.

2. Release the catch on the nylon cable holder (mounted on the inside of the back plate) by pressing the tab toward the back of the unit. Disconnect the cable from the analog card and lift the cable free of the drive.

3. Gently disconnect the other end of the ribbon cable from the interface card in the Apple. If the cable is a shielded "RFI" cable, loosen the clamping screw and remove the cable from the clamp.

Replacing the Cable:

4. Place the cable into the nylon cable holder so that the toroids (donut-shaped ferrite pieces) are just below the cable holder, and snap the holder shut.

5. Attach the ribbon cable plug to the connector on the analog card, making sure that both rows of pins align with the holes in the plug and that the arrow on the plug points to pin 1 on the connector. (The cable should exit away from the analog card.)

6. Replace the disk drive cover.

7. Then carefully attach the ribbon cable to the interface card, as shown in figure 1.

apple computer inc.

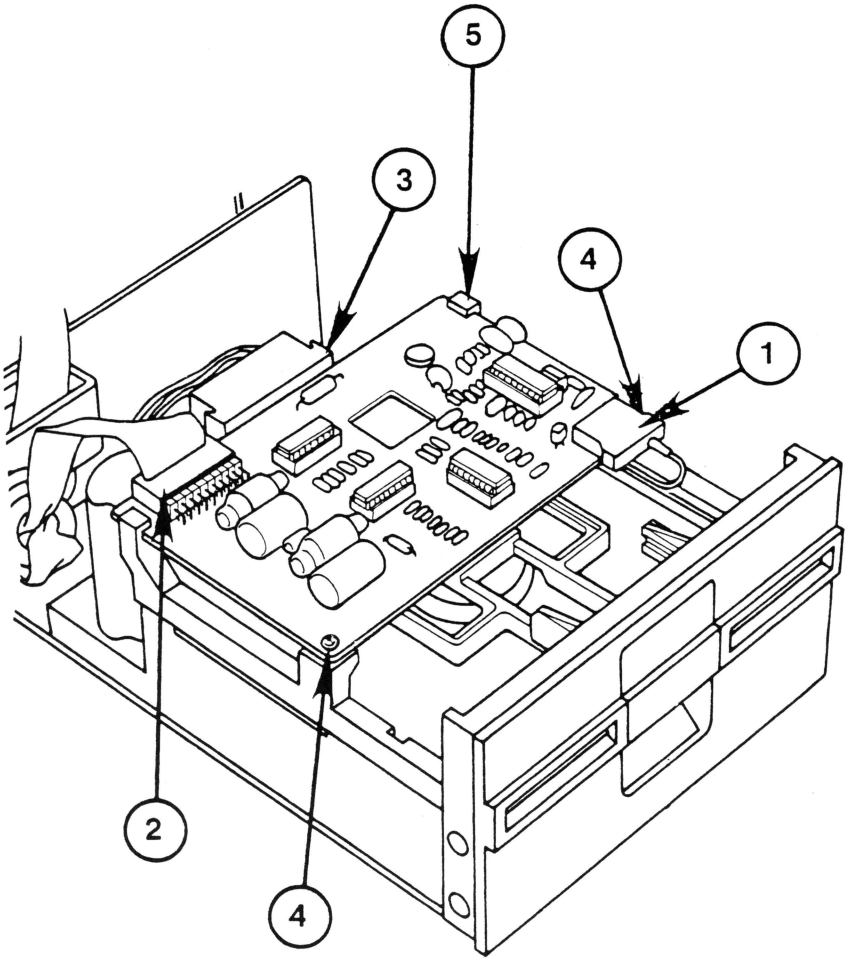


FIGURE 2

C. REPLACING THE ANALOG CARD

Removing the Analog Card:

1. Power down.

2. Remove the disk drive cover.

3. Gently remove the read/write head plug from the front of the analog card (Figure 2, #1).

4. Gently remove the ribbon cable plug from the rear of the card (#2).

5. Gently remove the motor plug from the rear of the card (#3).

6. Remove the two screws at the front of the analog card (#4).

   NOTE: These screws may have either standard or metric threads. To avoid intermixing, keep the screws with the disk drive they were taken from.

7. Slide the card forward past the retaining slots at the rear (#5), and then lift it out.

Replacing the Analog Card

8. Slide the card into position in the slots of the rear support posts (Figure 2, #5).

9. Reinstall the two screws (#4) to hold the card in place.

10. Attach the head plug (#1) to the card. Make sure that there is just enough loop in the cable so that it doesn't pull down on the head plug.

11. Attach the motor plug (#3) at the rear of the card.

12. Attach the ribbon cable plug (#2) at the rear of the card, making sure that both rows of pins align with holes in the connector.

13. Replace the disk drive cover.

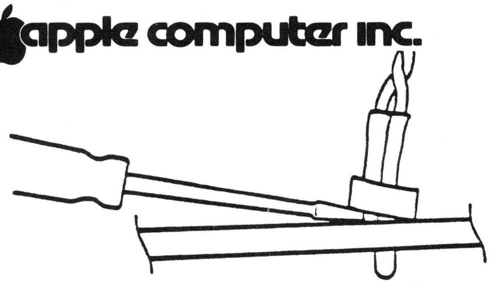


FIGURE 3

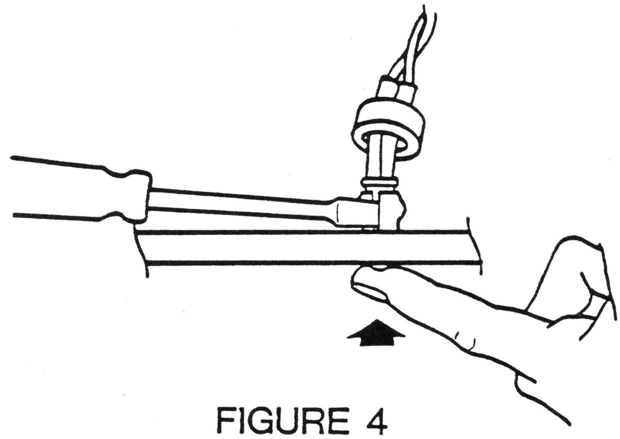


FIGURE 4

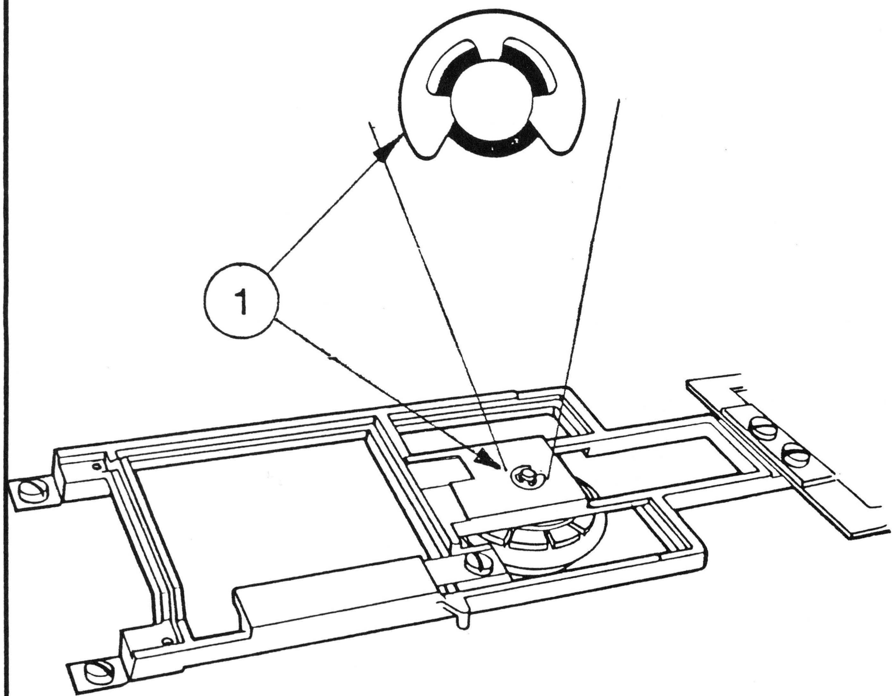


FIGURE 5

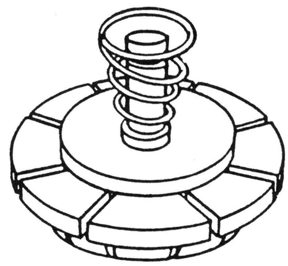


FIGURE 6

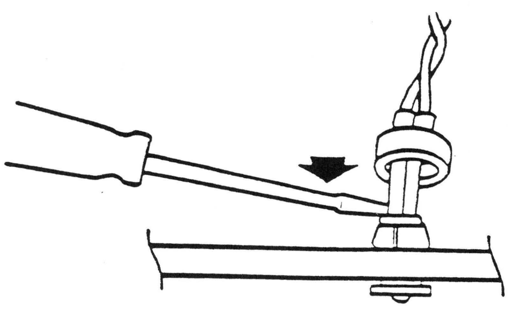


FIGURE 7

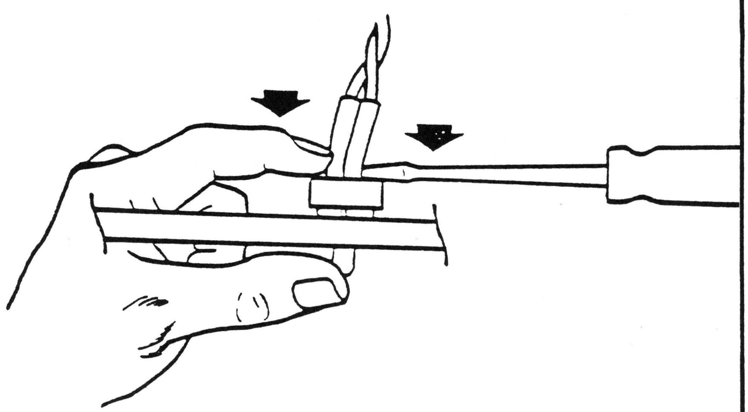


FIGURE 8

D. REPLACING THE COLLET HUB

Removing the Old Collet Hub

1. (Power off.) Remove the disk drive cover and analog card.

2. Remove the two screws on each side of the front bezel (front panel) of the unit.

3. Slide the bezel off the unit. If the bezel cannot be removed because the wires connecting the LED are too short, remove the LED as follows:

   a. Pry the small plastic retaining ring from around the LED holder with a screwdriver (Fig. 3). Slide the retaining ring up the wires and out of the way.

   b. Press the face of the LED in towards the drive, while gently prying apart the LED holder with a screwdriver (Fig. 4), until the LED snaps free of the bezel.

   c. Remove the bezel from the unit.

4. With a screwdriver, pry the retaining clip (Fig. 5, #1) off the shaft holding the collet.

5. Remove the collet hub assembly (Fig. 6); remove the spring and washer from the collet hub. (Remove the spring carefully, taking care not to stretch it.)

Installing the New Collet Hub

6. Place the washer and spring on the shaft of the new collet hub--the spring goes on small end down--and insert into the mounting arm.

7. Install the retaining clip.

8. Replace the bezel.

   NOTE: Make sure the door hinge pins fit properly in the slots on the back of the bezel. The hinge pins should be tilted back towards the collet hub during installation of the bezel.

9. If you removed the LED, replace it as follows:

   a. Slip the LED back in its holder and snap it into place with a screwdriver (Fig. 7).

   b. Slide the retaining ring down the wires and position it around the LED holder. Push the retaining ring back into place with a screwdriver (Fig. 8).

E. REPLACING THE HEAD LOAD BUTTON

The head load button is a small round pad of white felt, mounted in the head load arm (Fig. 9, #1), that holds the diskette surface against the read-write head. The button should sit just above the center of the read-write head, with its surface parallel to the surface of the head.

When the button is severely worn, it will look like a cylinder skewed to the right (as viewed from the front). At that point it should be replaced.

1. Lift up the Head Load Arm (Figure 9, #1), squeeze the top part of the load button with small needle-nose pliers, and let the button drop down.

2. Install a new load button by inserting it into the holder and pushing up until it snaps into place.

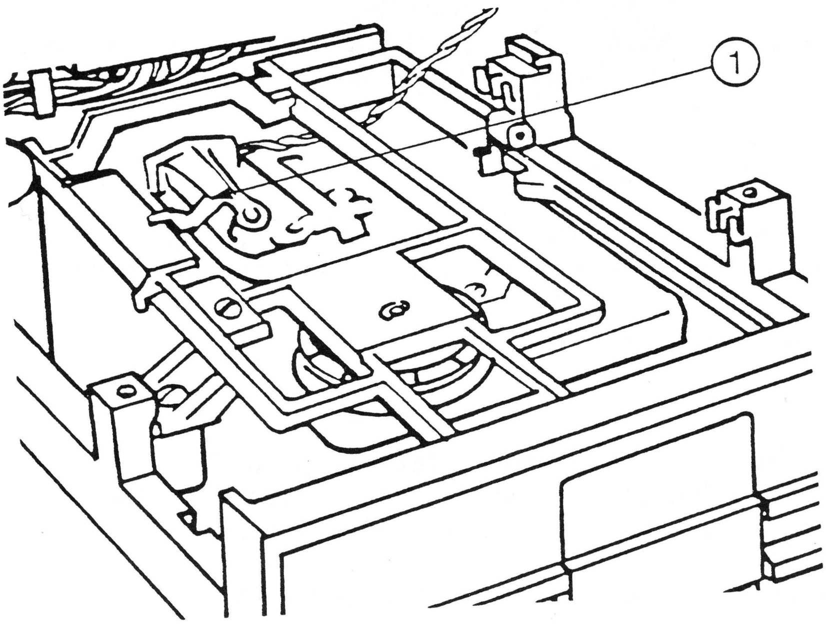


FIGURE 9

Disk][Technical Procedures

Section 2

Adjustments

Contents:

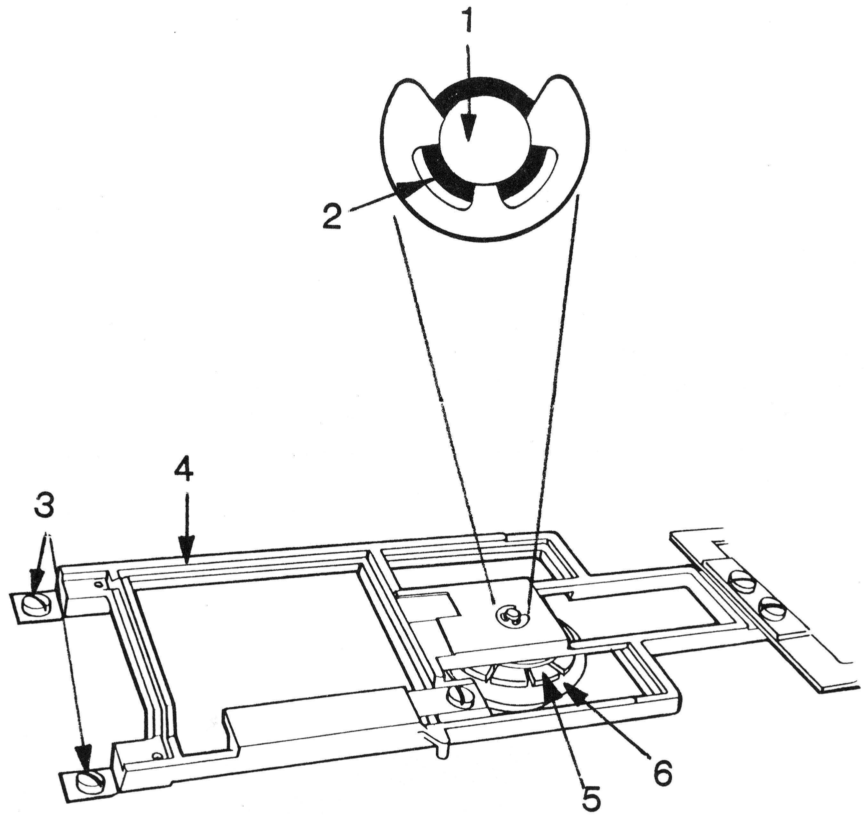


FIGURE 1

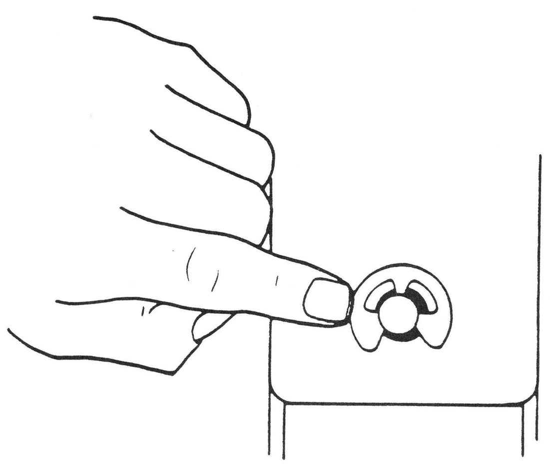


FIGURE 2

A. COLLET HUB ADJUSTMENT

If the diskette will not boot but you are able to get around the problem by opening and closing the drive door a few times, then the collet hub may need adjustment. Check it with the procedure below. If adjustment does not eliminate the booting problems, then the collet hub may need to be replaced (see section D above, p. 1.9).

TO CHECK ADJUSTMENT

1. Remove the analog card.

2. Looking straight down on the collet shaft (Figure 1, #1), close the door. Check to see that the shaft is centered.

3. Open and close the door again, observing to see that the collet hub moves cleanly into the center of its receptacle.

4. If the shaft is not centered (i.e., touches the side of the hole in the casting (Figure 1, #2)), go on to step 5.

TO ADJUST

5. Loosen the four screws (#3) on the bracket (#4): two on the back and two that hold the bracket to the door.

6. Close the door, and make sure that the collet hub (#5) is seated in its receptacle (#6).

7. Looking straight down on the collet shaft, move the bracket (#4) around until the shaft is dead center in the hole (#2).

8. Tighten the rear screws.

9. Check by repeating steps 2 and 3.

10. As a further check, open the door, push the collet shaft off-center (Figure 2), and then close and open the door a few times, making sure that the shaft reseats itself in the center of the hole.

11. As this procedure may affect the drive door adjustment, check the drive door adjustment as per section B (below, p. 2.5); readjust if necessary.

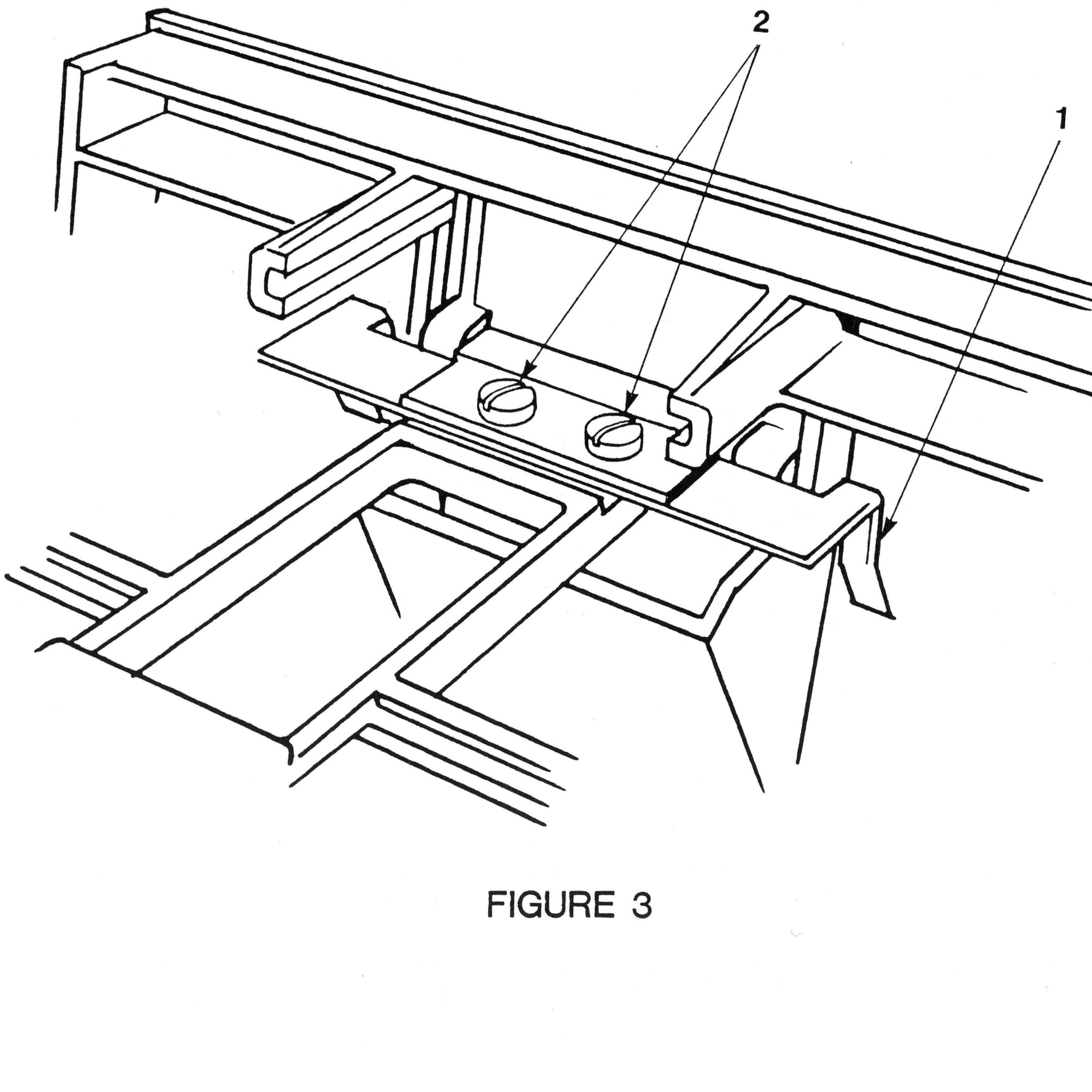


FIGURE 3

B. DRIVE DOOR ADJUSTMENT

When the disk drive door is closed, it should be centered in its slot and even with the surface of the bezel (front panel). If it appears out of alignment, or binds against the bezel or the diskette, perform the following adjustments.

1. (Power off.) Disconnect the drive from the Apple. Remove the cover and analog card.

2. Check the collet hub adjustment (see section A above (p. 2.3), step 2). The collet hub must be correctly adjusted before you adjust the door.

3. Loosen the two mounting screws (Fig. 3, #2) and center the door in its opening.

4. Check the door for evenness with the front of the bezel. Adjust the door if necessary; then tighten the door mounting screws.

5. Insert the Adjustment Tool into the drive and allow it to center properly.

6. While gently closing the drive door, observe the two guide bars (Figure 3, #1), which are visible when viewed from the back of the drive looking towards the front. There should be no binding between the guides and the tool.

7. If there is binding, or if the door is crooked, loosen the two door mounting screws (#2), close the door with the Adjustment Tool in place, and tighten the screws so that the guides just touch the tool with no binding.

C. DISKETTE STOP GUIDE ADJUSTMENT

The diskette stop guide is a piece of plastic that stops the diskette when it is far enough into the drive. It is almost never necessary to adjust it; in fact, on Alps models it has been eliminated as a separate component and incorporated into the casting itself.

Still, the Shugart stop guides get tinkered with, and when they are out of adjustment, the diskette can be so far off-center that it will be damaged when the collet hub seats itself.

TO ADJUST

1. (If the disk drive is connected to an Apple][, power off and disconnect the drive.) Remove the cover and analog card.

2. Insert the Disk Adjustment Tool.

3. See whether the tool is centered by gently closing the drive door and observing the collet hub. (When you close the drive door, the collet hub should seat itself directly in the hole in the center of the Adjustment Tool, and the tool should move very little.)

4. If the tool is too far forward or too far back, the stop guide is out of place. Loosen the stop guide mounting screw (accessible through the small round hole on the left side of the tool) and allow the guide to move back.

5. Center the Adjustment Tool correctly and gently close the drive door.

6. Adjust the stop guide so that it touches the Adjustment Tool; then tighten the mounting screw.

7. Apply Gliptol to the screw after you remove the Adjustment Tool.

D. DRIVE SPEED ADJUSTMENT -- THE D-SPEED TEST

If a drive will not boot disks, or gives many I/O error messages, or produces diskettes that other drives cannot read, it may be spinning too quickly or too slowly. This causes its reading and writing to be incompatible with that of other drives. The D-Speed test checks the speed of the drive so that you can adjust it to within standard tolerance.

The test works by writing a pattern to a scratch diskette and then reading it. If the test will not run, you may be using a defective scratch diskette; try another. If the test still will not run, the write-protect switch may be stuck in protect mode (see Write-Protect Switch Adjustment). If the test still will not run, replace the Analog Card with a known good one.

Adjusting the Speed:

1. Power down. Disconnect the customer's drive from his Apple.

2. Remove the cover of the customer's drive.

3. Using a known good interface card, connect the customer's drive to the DRIVE 2 position and a known good drive to the DRIVE 1 position. (Make sure all the pins are in the proper holes).

4. Using a known good Apple][, make sure power is down and then insert the interface card into slot 6.

5. Place the Disk Alignment Aid diskette in the known good drive and boot it.

6. When the menu comes up, SET TARGET DISK will be highlighted. Accept it by pressing A.

7. Set target for slot 6, drive 2, by pressing S, A, A. Press <ESC>.

8. Select D-SPEED test (press S, S, S, A).

9. The screen will warn you that the test will write on the diskette. Put a scratch diskette in the target drive and press A again.

   NOTE: At this point, the screen should show a scale with -100 on the left and +100 on the right, with a marker indicating the actual speed of the drive. The acceptable range is + or - 26. If the D-Speed is outside this range, proceed with the adjustment.

10. Look at the BACK of the drive mechanism. Locate the Motor Control Card, mounted on edge, and note the small trimpot with a screwdriver adjustment on the side (Figure 4, #1).

    NOTE: Do not confuse this with the trimpot(s) on the analog card!

11. Set the speed so that it indicates between -5 and 0. Press <ESC>, A, A. Allow the drive to run for 128 passes and confirm that the average D-speed is between -5 and 0. Readjust if necessary. Very erratic speed can sometimes be corrected by cleaning the pulleys with alcohol.

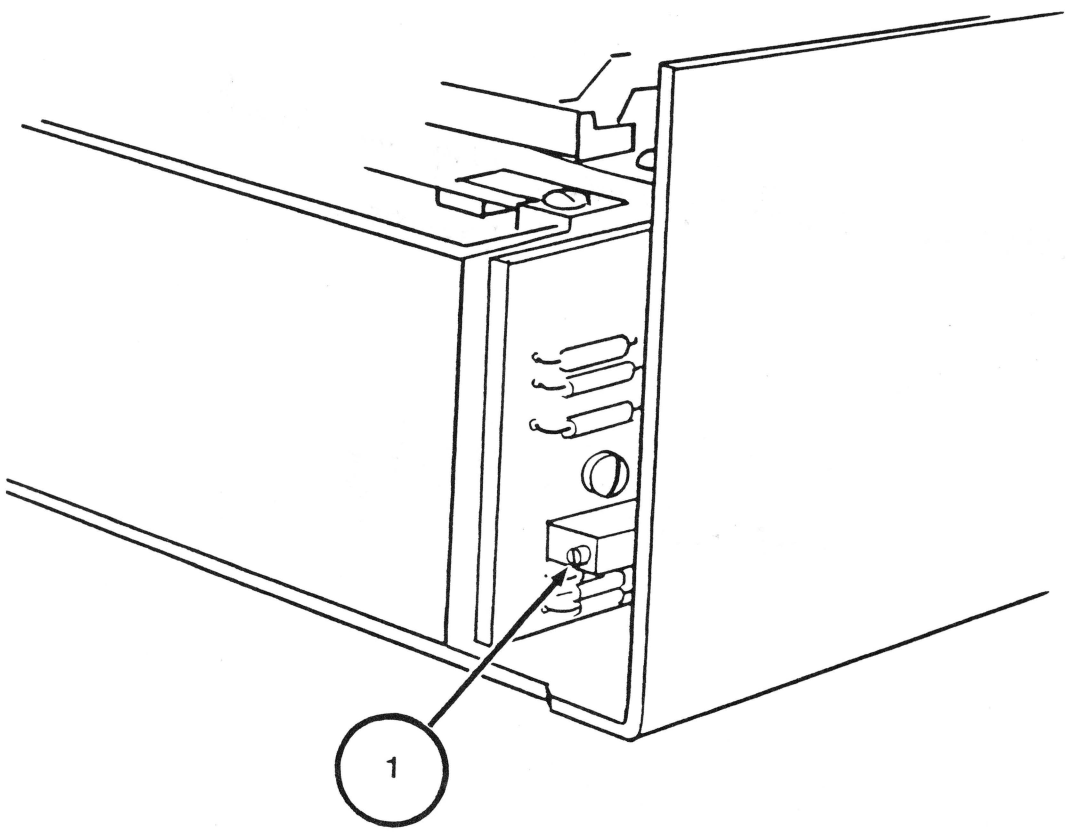


FIGURE 4

2 FIGURE 5

Disk Cal Disket (formerly alignment and
686-0006

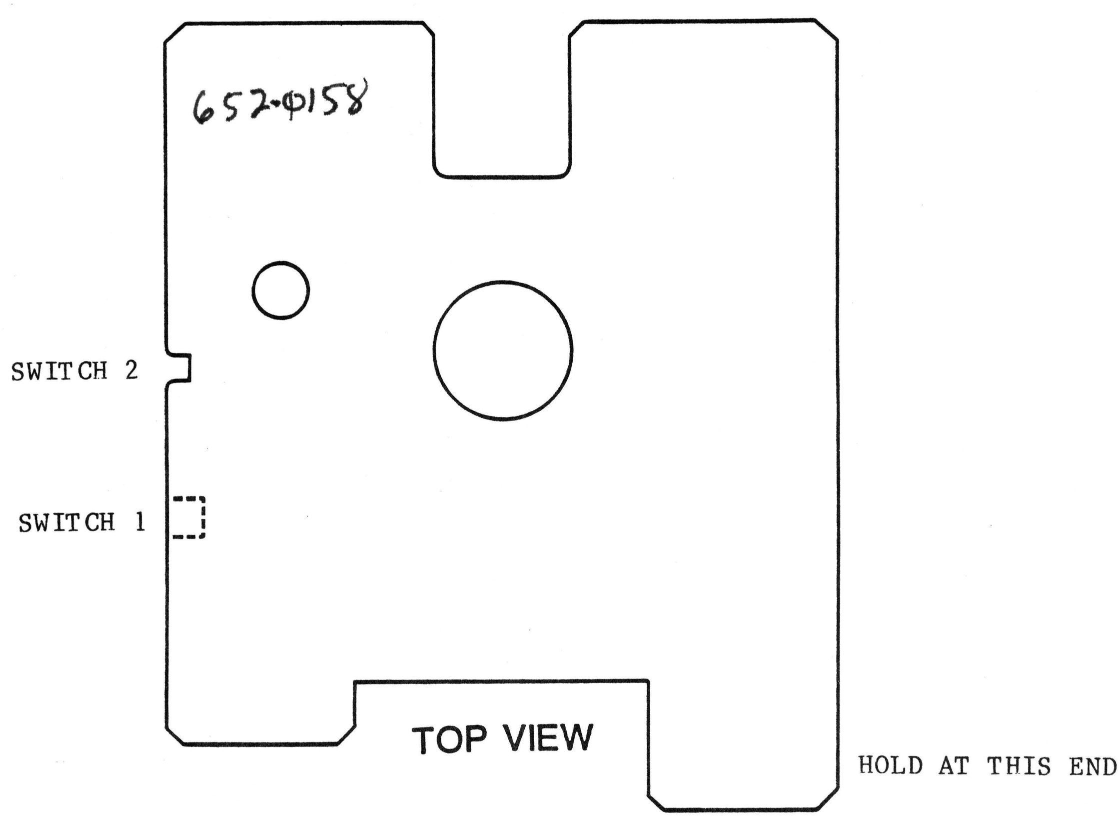


FIGURE 6

E. WRITE-PROTECT SWITCH ADJUSTMENT

If a customer complains that his system writes over write-protected diskettes, or refuses to write on non-protected diskettes, calling them "write-protected", then his write-protect switch may need adjustment or replacement. Before you replace it, try to adjust it using the following procedure. You will need: the Disk Alignment Aid diskette; the Disk Alignment Tool (P/N UM 652-0158); an Allen wrench or small screwdriver (depending on the drive); and a known good Apple][and interface card.

1. Power down. Disconnect the customer's drive from his Apple.

2. Remove the cover of the customer's drive.

3. Using a known good interface card, connect the customer's drive to the DRIVE 1 position. (Make sure all the pins are in the proper holes).

4. Using a known good Apple][, make sure power is down and then insert the interface card in slot 6.

5. Boot the Disk Alignment Aid diskette and select WRT PROTECT SWITCH from the menu. When the drive starts running, remove the diskette.

6. The switch is located just inside the front left side of the housing as you face the drive door. Locate the two setscrews holding the write-protect switch in place (Figure 5, #1 & 2). The far setscrew (Figure 5, #1) forms a pivot for the switch; the near setscrew (#2) sets the switch position.

7. Holding the Disk Alignment Tool as in figure 6, insert it all the way into the drive and leave the drive door open; then turn the disk drive upside down.

8. Loosen the rear setscrew; then loosen the front setscrew and allow the switch to rise. The monitor should display the message "SWITCH ENABLED."

9. Press down on the front setscrew (#2) until the monitor displays the message "SWITCH DISABLED", and then tighten it.

10. Tighten rear setscrew (#1).

11. Turn the drive right side up and check the adjustment by withdrawing the Alignment Tool to the switch 2 position. The switch should be enabled. Push the Alignment tool all the way in (switch 1 position). The switch should be disabled.

12. Verify again, using a diskette with a write-protect tab pinched thin (this is a worst-case test).

If steps 8 and 9 do not produce the correct screen displays, replace the switch. If the problem still remains, replace the analog card.

Disk Drive Technical Procedures

Section 3

Calibration

Contents:

A. GENERAL

Before doing any of the procedures, make sure that the head carriage rails are clean. Use alcohol to clean them.

CAUTION: DO NOT LUBRICATE THE GUIDE RAILS! USE NO LUBRICANT OF ANY KIND ON THE DRIVE, NO MATTER HOW TEMPTING IT MAY BE!

The amplitude test should be done any time there are problems reading data or programs, especially those that the drive being tested has written. It checks whether the electronics are producing a large enough signal to operate reliably.

The azimuth test should be done any time a drive has problems reading data or programs, or when there is an incompatability problem between drives (i.e. one has trouble reading what the other writes). It checks whether the head is perpendicular to the track (or radial to the center of the diskette, however you want to look at it). This ensures that it will never be reading part of one bit from the left edge of the track and part of an adjacent bit from the right edge of the track.

The Carriage limiter adjustment should be done when you have trouble booting, or have a compatability problem between drives (i.e. one has trouble reading what the other writes). It sets the position of the read-write head so that it moves to the correct position whenever the drive seeks track 0. It is a rough adjustment. It should always be followed with the head radial adjustment.

The Head Radial adjustment should be done when you have trouble booting, or have a compatability problem between drives (i.e. one has trouble reading what the other writes). It should also be done after the carriage limiter adjustment is done. It fine-tunes the head position so that it will move to the exact center of each track.

The comparator offset adjustment should be done if the Analog board is replaced. It ensures that a "one" stored on the disk will be read as a one, and a "zero" as a zero.

The procedures in this section should also be performed whenever you replace the analog card or the disk mechanical assembly, or replace any component on the analog card.

If you are doing more than one test/adjustment, and you probably will be, you should do them in the order in which they appear here.

B. AMPLITUDE TEST

The amplitude test should be done any time there are problems reading data or programs, especially those that the drive being tested has written.

This test checks whether the electronics are producing a large enough signal to operate reliably.

Materials needed:

1. Apple][system with known-good disk drive and interface.
2. Disk Calibration Diskette (P/N 686-0006)
   or
   Disk Alignment Aid diskette (P/N 652-0199)
3. Scratch (expendable) diskette
4. Drive to be tested
5. Oscilloscope
6. #2 Philips screwdriver

To run the Amplitude Test:

Apple and Drive Set-up:

1. Turn the Apple]['s power off.

2. Install the known good Disk Interface card in slot 6.

3. Connect the known good drive to the Drive 1 position of the Interface card.

4. Remove the cover from the drive to be tested. Connect the drive to the Drive 2 position on the Interface card.

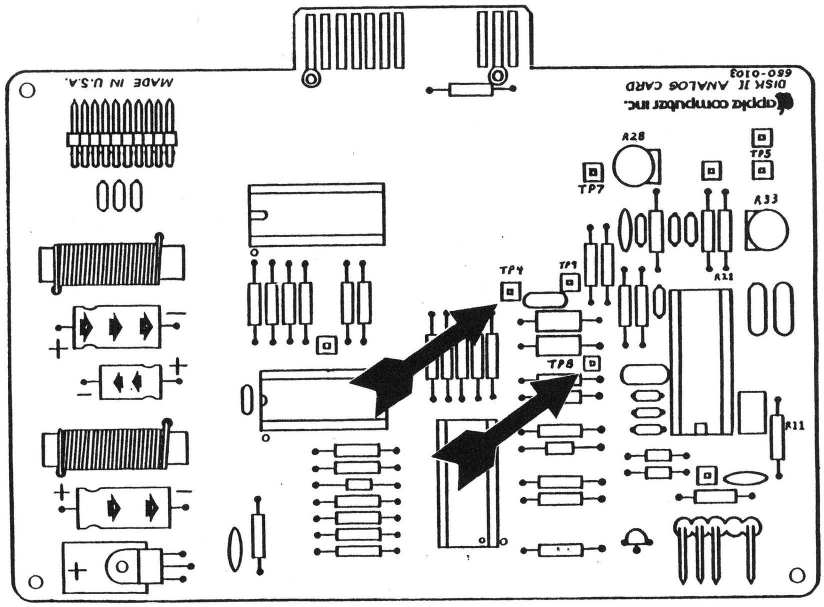
Oscilloscope Set-up:

5. Set the oscilloscope controls as follows:
   SECONDS(or TIME)/DIV = 1 uSEC/DIV
   VOLTS(or AMPLITUDE)/DIV = 50 MV/DIV (5 MV/DIV for 10X probe)
   Trigger source (INT/EXT) = INT
   Trigger slope (POS/NEG) = POS
   Input (AC/DC/GND) = AC
   Display (CH1/CH2 or A/B) = CH1 or A
   Sweep Mode (AUTO/NORM) = AUTO
   Power (ON/OFF) = ON
   INTENSITY and FOCUS for a clear sweep display

6. Connect the probe cable to the channel 1 (or A) input of the oscilloscope.

CONTINUED ON NEXT PAGE

7. Connect the probe tip to TP8 and the ground lead to TP4 on the Analog Card of the drive being tested.



The Test:

8. Boot the Calibration (or Alignment Aid) Diskette in the known good drive, then remove the diskette (let's not take any chances).

9. Put the scratch diskette in the drive being tested.

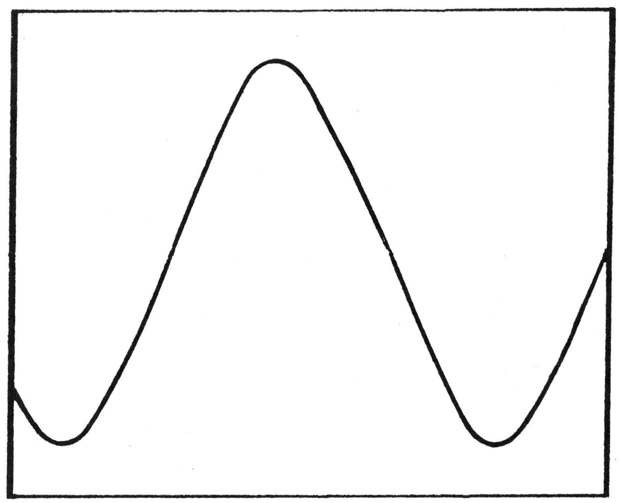
10. After the main menu appears, slowly type **ASAA** to select drive 2 as the target disk, then press <ESC>.

11. Slowly type **SSA** to select the Amplitude test.

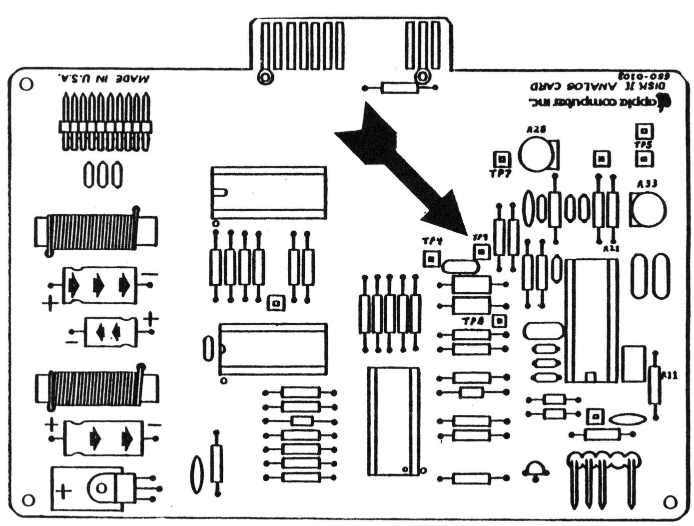
12. A warning will be displayed on the screen that the test will write on any diskette in the target drive. Type **A** to proceed with the test.

CONTINUED ON NEXT PAGE

13. After the test signal has been written to the diskette, a message will be displayed to tell you that you may proceed with the test. Adjust the oscilloscope's trigger LEVEL control for a clear, stable display. The waveform should appear as follows, with a minimum amplitude of 150 MV (3 divisions).



14. Place the probe tip on TP9. Check that the display shows the same waveform as in step 13.



15. Turn the Apple][off, then disconnect the customer's drive and (assuming that it is good at this point) re-assemble it.

This concludes the Amplitude Test.

If the amplitude is found to be unacceptable, replace the disk mechanical assembly and run the test again. If the problem persists, replace the analog card (on the customer's mechanical assembly) and run the test again.

C. AZIMUTH TEST

The azimuth test should be done any time a drive has problems reading data or programs, or when there is an incompatability problem between drives (i.e. one has trouble reading what the other writes).

This test checks whether the head is perpendicular to the track.

Materials needed:

1. Apple][system with known-good disk drive and interface.
2. Disk Calibration Diskette (P/N 686-0006)
   or
   Disk Alignment Aid diskette (P/N 652-0199)
3. Alignment diskette (P/N 090-0004)
4. Drive to be tested
5. Oscilloscope
6. #2 Philips screwdriver

To run the Azimuth Test:

Apple and Drive Set-up:

1. Turn the Apple]['s power off.

2. Install the known good Disk Interface card in slot 6.

3. Connect the known good drive to the Drive 1 position of the Interface card.

4. Remove the cover from the drive to be tested. Connect the drive to the Drive 2 position on the Interface card.

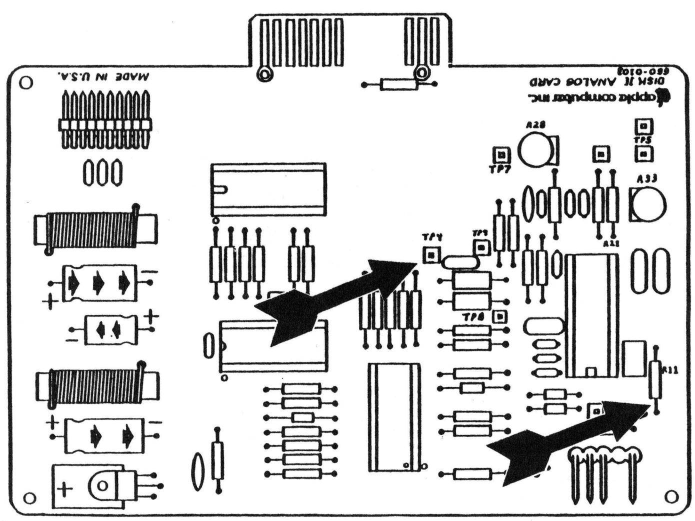
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Disk Safety Check

5. Set the oscilloscope controls as follows:
SECONDS(or TIME)/DIV = 10 MSEC/DIV
VOLTS(or AMPLITUDE)/DIV = 5 V/DIV (.5 V/DIV for a 10X probe)
Trigger source (INT/EXT) = INT
Trigger slope (POS/NEG) = POS
Input (AC/DC/GND) = GND
Display (CH1/CH2 or A/B) = CH1 or A
Sweep Mode (AUTO/NORM) = AUTO
Power (ON/OFF) = ON
INTENSITY and FOCUS for the best trace display
CH1 (or A, or VERT) POSITION to center the trace vertically

6. Connect the probe cable to the channel 1 (or A) input of the oscilloscope.

7. Connect the probe tip to the front end of R11 and the ground lead to TP4 on the Analog Card of the drive being tested.



8. Boot the Calibration (or Alignment Aid) Diskette in the known good drive, then remove the diskette (let's not take any chances).

9. After the main menu appears, slowly type **ASAA** to select drive 2 as the target disk, then press <ESC>.

10. Slowly type **SSSSA** to select the Seek function. The drive being tested should recalibrate and spin.

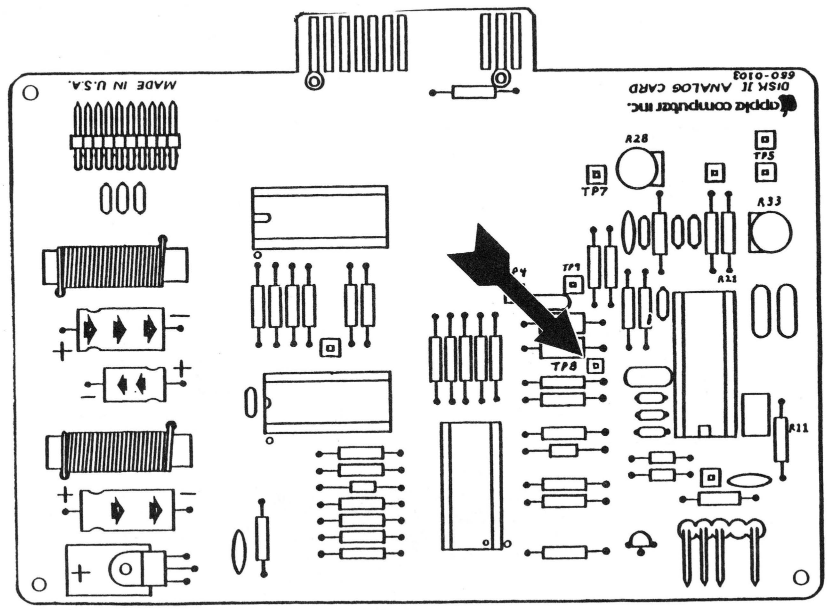
11. While watching the trace, switch the oscilloscope's input selector (AC/DC/GND) to DC. If the trace moves up or down, DO NOT CONTINUE WITH THE TEST. Replace the analog card and start again.

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The Test:

12. Change the oscilloscope controls as follows:
SECONDS(or TIME)/DIV = .5 MSEC/DIV
VOLTS(or AMPLITUDE)/DIV = 50 MV/DIV (5 MV/DIV for 10X probe)
Input (AC/DC/GND) = AC
Sweep Mode (AUTO/NORM) = NORM (the trace will disappear)

13. Connect the probe tip to TP8.



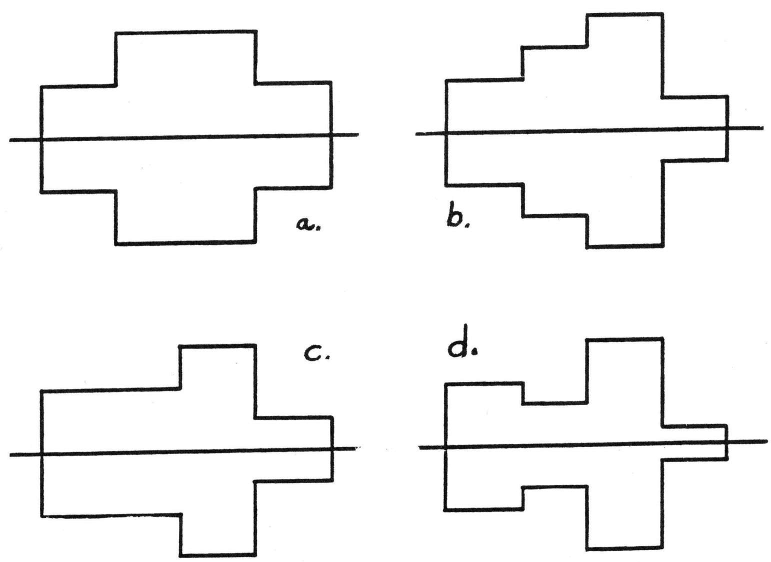
14. Put the Alignment diskette (090-0004) in the drive being tested.

15. Slowly type **SSSA34**, then press <RETURN> to move the head to track 34.

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16. Turn the oscilloscope's trigger LEVEL control all the way to the left and then back to the right until you can see the waveform clearly, then adjust the INTENSITY and FOCUS for the best display. The waveform should be a pattern of four bursts. The amplitude of the second should be equal to or greater than the amplitude of the first; the amplitude of the third should be equal to or greater than the amplitude of the fourth. Diagrams a, b, and c show acceptable patterns, diagram d shows an unacceptable one.

Track 1 Show b
Track 30 Better close TOA



17. Slowly type **A1**, then press <RETURN> to move the head to track 1. The waveform should be the same as the one observed in step 16.

18. Turn the Apple][off, then disconnect the customer's drive and (assuming that it is good at this point) re-assemble it.

This concludes the Azimuth Test.

If the pattern at either or both tracks is found to be unacceptable, replace the disk mechanical assembly and run the test again. If the problem persists, replace the analog card (on the customer's mechanical assembly) and run the test again.

CAUTION: If the drive is out of adjustment, disks that it has written to may not be readable in a properly adjusted drive. Before repairing it, test the suspect disks in a known good drive and copy them if necessary (reading them in the mis-adjusted drive and writing the copies in a known good drive).

D. CARRIAGE LIMITER ADJUSTMENT

The Carriage Limiter adjustment should be done when you have trouble booting, or have a compatability problem between drives (i.e. one has trouble reading what the other writes).

This adjustment sets the position of the read-write head so that it moves to the correct position whenever the drive seeks track 0. It is a rough adjustment. It should always be followed with the head radial adjustment.

Materials needed:

1. Apple][system with known-good disk drive and interface.
2. Disk Calibration Diskette (P/N 686-0006)
   or
   Disk Alignment Aid diskette (P/N 652-0199)
3. #0 and #2 Phillips screwdrivers
4. Small flat-bladed screwdriver ("tweeker")
5. Feeler gauge (.020")
6. Drive to be adjusted

To adjust the carriage limiter

Set-up

1. Turn the Apple]['s power off.

2. Install the known good Disk Interface card in slot 6.

3. Connect the known good drive to the Drive 1 position of the Interface card.

4. Remove the cover from the drive to be tested. Connect the drive to the Drive 2 position on the Interface card.

5. Remove the screws that hold the analog card, and remove the read/write head wires from the clips on the right-side analog card supports.

6. Lean the analog card toward the back of the drive (Make sure that the head wires have enough slack to allow the carriage to move to its forward limit. To check, slide the carriage by hand to its forward limit. If the cable is too tight, adjust the position of the analog card.)

   CAUTION: MAKE SURE THAT THE ANALOG CARD ISN'T TOUCHING ANYTHING THAT MAY CAUSE AN ELECTRICAL SHORT.

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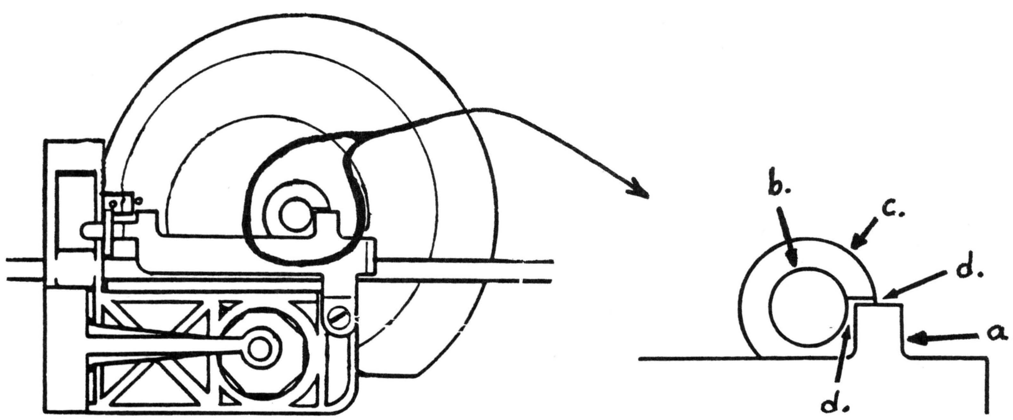
The Test:

7. Boot the Calibration (or Alignment Aid) diskette in the known-good drive.

8. After the main menu appears, set slot 6, drive 2 as the drive to be tested by slowly typing **ASAA**, then press <ESC>.

9. Slowly type **SSSSA**. The drive will recalibrate to track zero and continue to run.

10. The Carriage Limiter (a) should clear the Stepper Motor Shaft (b), and the Actuator Cam (c), by about .02" (d). Use a .020" feeler gauge to measure the clearance.

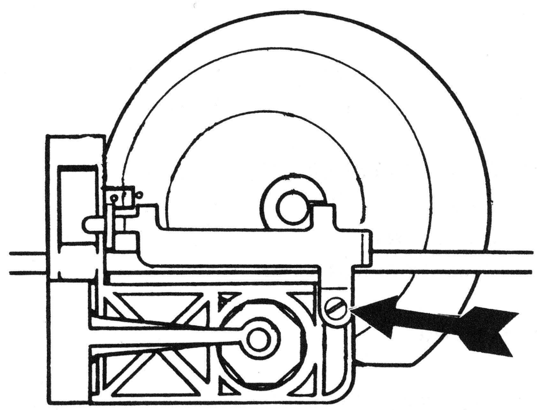


11. If adjustment is necessary, continue with this procedure. Otherwise turn the Apple][off, then disconnect and re-assemble the customer's drive.

    CAUTION: If the drive is out of adjustment, disks that it has written to may not be readable in a properly adjusted drive. Before proceeding, test the suspect disks in a known good drive and copy them if necessary (reading them in the mis-adjusted drive and writing the copies in a known good drive).

The Adjustment:

12. Loosen the adjustment screw and adjust the clearance, then re-tighten the screw.
CAUTION: The carriage limiter screw is easily stripped. Take care when tightening it.



13. Move the carriage forward by hand until you feel the cam rider drop back into the channel of the cam.

14. Type **A** to cause the drive to recalibrate again, then check that the clearance is still correct (see step 10). Re-adjust if necessary.

15. Slowly type **SSSA34** and press <RETURN>. Check to see that the head has moved forward almost to its limit but that no contact is made between the Cam Stop Extension (figure above, f) and the Stepper Motor Shaft (figure above, b).

16. Turn the Apple][off, re-install the Analog card, then turn to page 3.14 and do the Head Radial Adjustment procedure.

This concludes the Carriage Limiter adjustment.

E. HEAD RADIAL ADJUSTMENT

The Head Radial adjustment should be done when you have trouble booting, or have a compatability problem between drives (i.e. one has trouble reading what the other writes). It should also be done after the carriage limiter adjustment is done.

This adjustment fine-tunes the head position so that it will move to the exact center of each track.

Materials needed:

1. Apple][system with known-good disk drive and interface.
2. Disk Calibration Diskette (P/N 686-0006)
   or
   Disk Alignment Aid diskette (P/N 652-0199)
3. Disk Alignment diskette (P/N 090-0004)
4. #2 Phillips screwdriver
5. Medium flat-bladed screwdriver
6. Oscilloscope
7. Drive to be adjusted

To do the head radial adjustment:

Apple and Drive Set-up

1. Turn the Apple]['s power off.

2. Install the known good Disk Interface card in slot 6.

3. Connect the known good drive to the Drive 1 position of the Interface card.

4. Remove the cover from the drive to be tested.

5. Connect the drive to the Drive 2 position on the disk interface card.

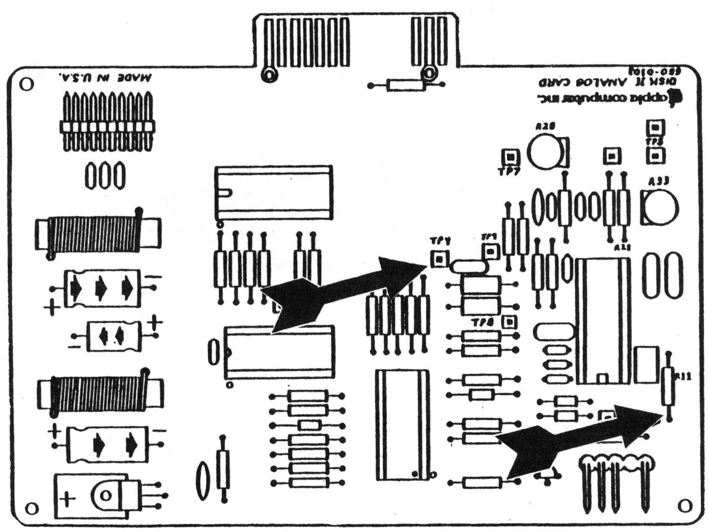
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Disk Safety Check

6. Set the oscilloscope controls as follows:
   SECONDS(or TIME)/DIV = 10 MSEC/DIV
   VOLTS(or AMPLITUDE)/DIV = 5 V/DIV (.5 V/DIV for a 10X probe)
   Trigger source (INT/EXT) = INT
   Trigger slope (POS/NEG) = POS
   Input (AC/DC/GND) = GND
   Display (CH1/CH2 or A/B) = CH1 or A
   Sweep Mode (AUTO/NORM) = AUTO
   Power (ON/OFF) = ON
   INTENSITY and FOCUS for the best trace display
   CH1 (or A, or VERT) POSITION to center the trace vertically

7. Connect the probe cable to the channel 1 (or A) input of the oscilloscope.

8. Connect the probe tip to the front end of R11 and the ground lead to TP4 on the Analog Card of the drive being tested.



9. Boot the Calibration (or Alignment Aid) diskette in the known-good drive, then remove the diskette.

10. After the main menu appears, slowly type **ASAA** to set slot 6, drive 2 as the drive to be tested, then press <ESC>.

11. Slowly type **SSSSA** to select the Seek function. The target disk will recalibrate and continue to run.

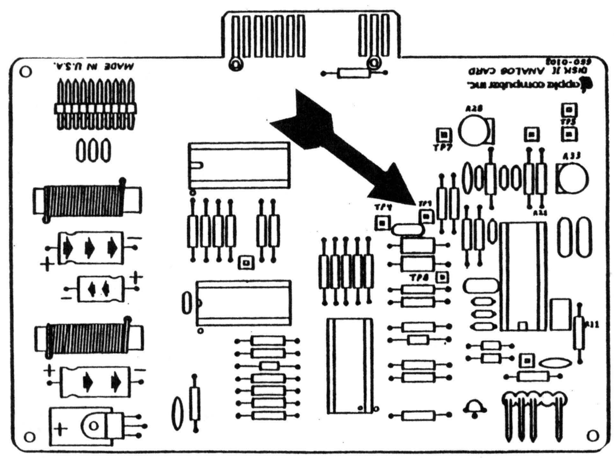
12. While watching the trace, switch the oscilloscope's input selector (AC/DC/GND) to DC. If the trace moves up or down, DO NOT CONTINUE WITH THE TEST. Replace the analog card and start again.

CONTINUED ON NEXT PAGE

The Test:

13. Change the oscilloscope controls as follows:
    SECONDS(or TIME)/DIV = 20 MSEC/DIV
    VOLTS(or AMPLITUDE)/DIV = 50 MV/DIV (5 MV/DIV for 10X probe)
    Input (AC/DC/GND) = AC
    Sweep Mode (AUTO/NORM) = NORM (the trace will disappear)

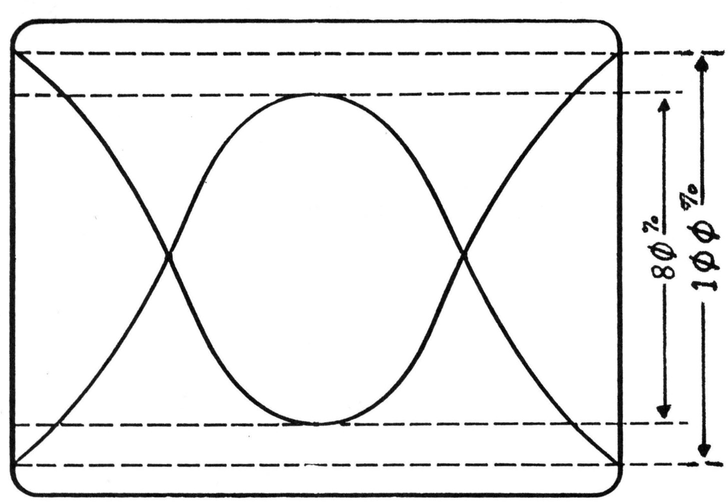
14. Connect the scope probe tip to TP9.



15. Put the Alignment diskette (090-0004) into the drive to be adjusted.

16. Slowly type **SSSA16**, then press <RETURN> to move the head to track 16.

17. Turn the oscilloscope's trigger LEVEL control all the way counter-clockwise, then rotate it slowly clockwise until a "lobe" pattern appears. Adjacent lobes should be about the same size, with the smaller being no less than 80% the size of the larger.



CONTINUED ON NEXT PAGE

18. If the drive needs adjustment, continue this procedure. Otherwise turn the Apple][off, then disconnect the customer's drive and reassemble it.

CAUTION: If the drive is way out of adjustment (e.g. smaller lobe only half the size of the larger lobe), disks that it has written to may not be readable in a properly adjusted drive. Before proceeding, test the suspect disks in a known good drive and copy them if necessary (reading them in the mis-adjusted drive and writing the copies in a known good drive).

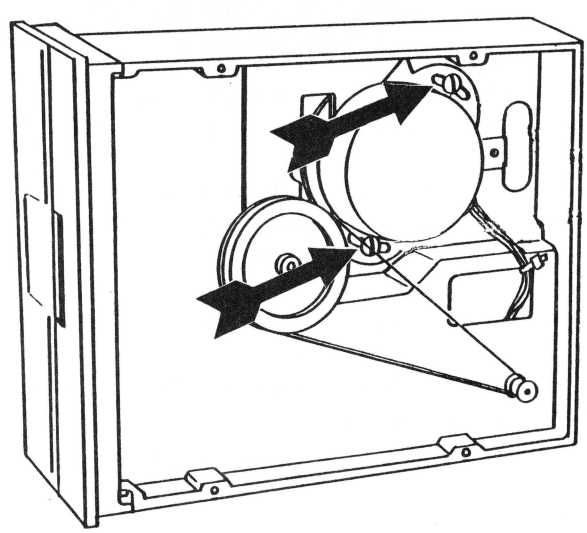
The Adjustment:

19. Free the ribbon cable from the cable clip mounted on the inside back plate of the drive.

20. Turn the drive on its side on a non-conducting surface and remove the base plate.

21. Slightly loosen the two mounting screws holding the stepper motor to the casting.

NOTE: If the motor is very loose, the adjustment will be difficult to make.



22. Determine what type of drive you have by looking at the label on the bottom of the mechanical assembly. If the drive is labeled "APPLE COMPUTER INC.", it is an ALPS drive. If it is labeled "SHUGART ASSOCIATES", it is a SHUGART drive.

Go to the next page if you have an ALPS drive
Go to page 3.18 if you have a SHUGART drive

ALPS Drive adjustment:

23. Adjust the relative sizes of adjacent lobes by rotating the stepper motor slightly. When the lobes are as close to the same size as you can get them, hold the stepper motor in place and tighten the mounting screws.

24. Turn the drive to its normal operating position (usually bottom down).

25. Slowly type **SA** to recalibrate the drive.

26. Slowly type **SSSA16**, then press <RETURN> to move the head back to track 16.

27. Wait about thirty seconds for the drive to settle, then re-check the pattern on the scope. If the smaller of the adjacent lobes is not at least 80% as big as the larger, slightly loosen the mounting screws and repeat steps 23-27 (up to two times).

28. If the previous step was successful, slowly type **A34**, then press <RETURN> to move the head to track 34.

29. Slowly type **A16**, then press <RETURN> to move the head back to track 16 from the other direction.

30. Wait about thirty seconds for the drive to settle, then re-check the pattern on the scope. If the smaller of the adjacent lobes is not still at least 80% as big as the larger, slightly loosen the mounting screws and repeat steps 23-30 (up to two times).

31. After you have completed the adjustment, turn the Apple][off, disconnect the customer's drive, apply Glyptol to the mounting screws and re-assemble the drive.

This completes the Head Radial Adjustment procedure for ALPS drives.

If you were unable to make the adjustment, replace the mechanical assembly and run the test again.

SHUGART drive adjustment:

23. Rotate the stepper motor slowly counterclockwise until the smaller of the adjacent lobes is about half the size of the larger.

24. Rotate the motor slowly clockwise. When the smaller of the adjacent lobes is as close to 80% as big as the larger as you can get it, hold the stepper motor in place and tighten the mounting screws.

25. Turn the drive to its normal operating position (usually bottom down).

26. Slowly type **SA** to recalibrate the drive.

27. Slowly type **SSSA16**, then press <RETURN> to move the head back to track 16.

28. Wait about thirty seconds for the drive to settle, then re-check the pattern on the scope. If the smaller of the adjacent lobes isn't still at least 80% as big as the larger, loosen the mounting screws and repeat steps 24-28 (up to two times).

29. If the previous step was successful, slowly type **A34**, then press <RETURN> to move the head to track 34.

30. Slowly type **A16**, then press <RETURN> to move the head back to track 16 from the other direction.

31. Wait about thirty seconds for the drive to settle, then re-check the lobe pattern on the scope. If the smaller of the adjacent lobes isn't still at least 80% as big as the larger, loosen the mounting screws and repeat steps 24-31 (up to two times).

32. After you have completed the adjustment, turn the Apple][off, disconnect the customer's drive, apply Glyptol to the mounting screws and reassemble the drive.

This completes the Head Radial Adjustment procedure for SHUGART drives.

If you were unable to make the adjustment, replace the mechanical assembly and run the test again.

F. COMPARATOR OFFSET ADJUSTMENT:

The comparator offset adjustment should be done if the Analog board is replaced.

It ensures that a "one" stored on the disk will be read as a one, and a "zero" as a zero.

Materials needed:

1. Apple][system with known-good disk drive and interface.
2. Disk Calibration Diskette (P/N 686-0006)
   or
   Disk Alignment Aid diskette (P/N 652-0199)
3. Scratch (expendable) diskette
4. Drive to be tested
5. Oscilloscope
6. #2 Philips screwdriver

To run the Amplitude Test:

Apple and Drive Set-up:

1. Turn the Apple]['s power off.

2. Install the known good Disk Interface card in slot 6.

3. Connect the known good drive to the Drive 1 position of the Interface card.

4. Remove the cover from the drive to be tested. Connect the drive to the Drive 2 position on the Interface card.

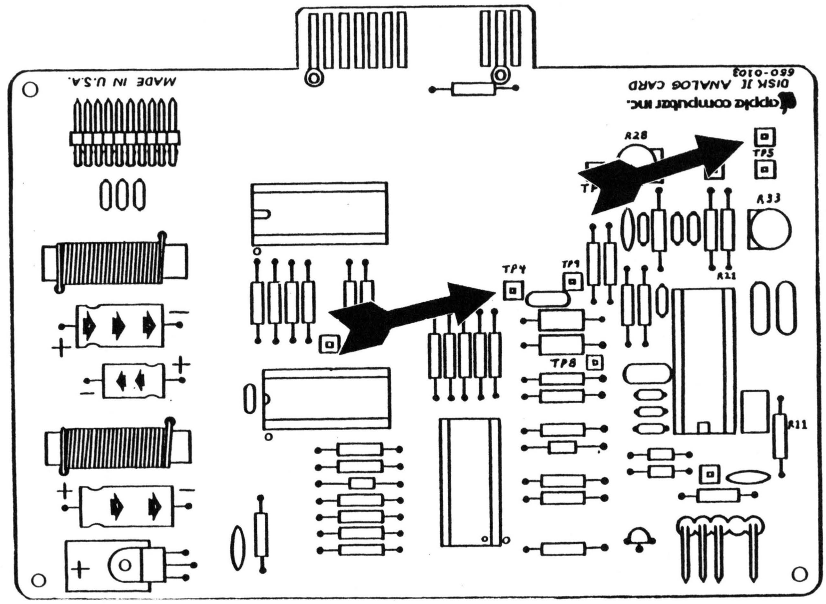
Oscilloscope Set-up:

5. Set the oscilloscope controls as follows:
   SECONDS(or TIME)/DIV = .5 uSEC/DIV
   VOLTS(or AMPLITUDE)/DIV = 1 V/DIV (.1 V/DIV for 10X probe)
   Trigger source (INT/EXT) = INT
   Trigger slope (POS/NEG) = NEG
   Input (AC/DC/GND) = AC
   Display (CH1/CH2 or A/B) = CH1 or A
   Sweep Mode (AUTO/NORM) = AUTO
   Power (ON/OFF) = ON
   INTENSITY and FOCUS for a clear sweep display

6. Connect the probe cable to the channel 1 (or A) input of the oscilloscope.

CONTINUED ON NEXT PAGE

7. Connect the probe tip to TP5 and the ground lead to TP4 on the Analog Card of the drive being tested.



The Test:

8. Boot the Calibration (or Alignment Aid) Diskette in the known good drive, then remove the diskette.

9. Put the scratch diskette in the drive being tested.

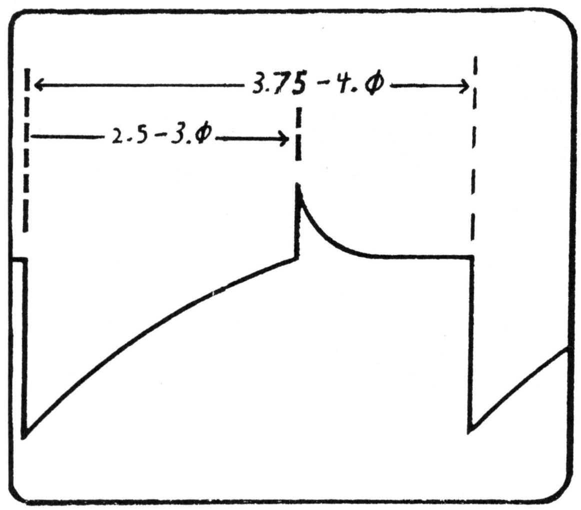
10. After the main menu appears, slowly type **ASAA** to select drive 2 as the target disk, then press <ESC>.

11. Slowly type **SSA** to select the Amplitude test.

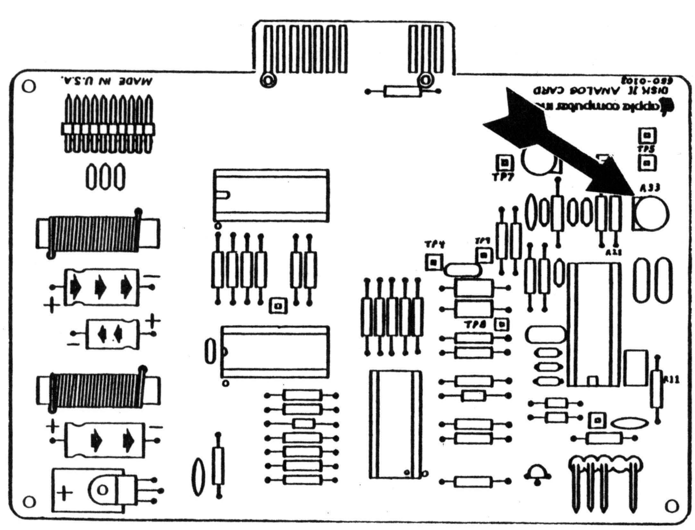
12. A warning will be displayed on the screen that the test will write on any diskette in the target drive. Type **A** to proceed with the test.

CONTINUED ON NEXT PAGE

13. After the test signal has been written to the diskette, a message will be displayed to tell you that you may proceed with the test. Adjust the oscilloscope's trigger LEVEL and INTENSITY controls for a stable display (though some jitter may be present near the right end). The rising portion of the pulse should be 2.5 - 3.0 microseconds wide (5 - 6 divisions). The total pulse width will be 3.75 - 4.0 microseconds (7.5 - 8 divisions).



14. If necessary, adjust potentiometer R21 or R33 until the central peak is in the correct position.
NOTE: On most Analog boards, R21 is a fixed resistor and R33 is the adjustment. On some, R21 is a potentiometer and should be used for the adjustment. On other boards, neither potentiometer is present. In this last case, the board must be replaced if adjustment is indicated.

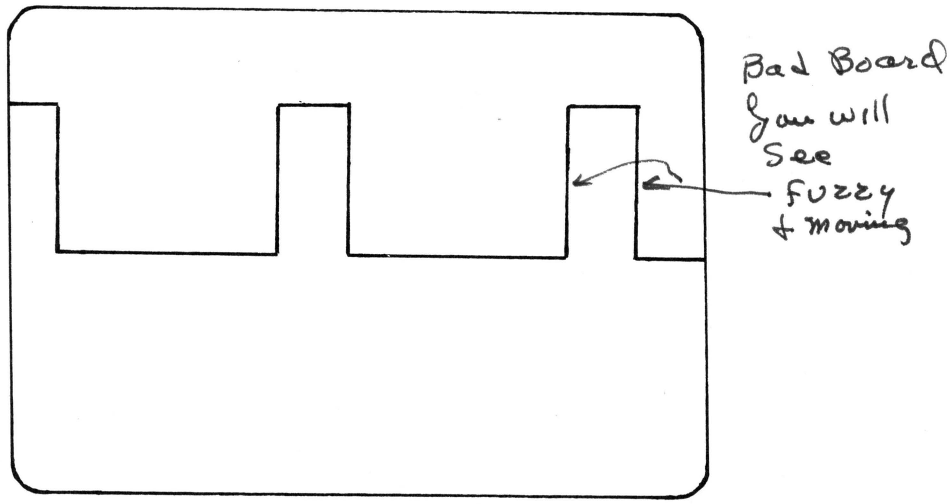


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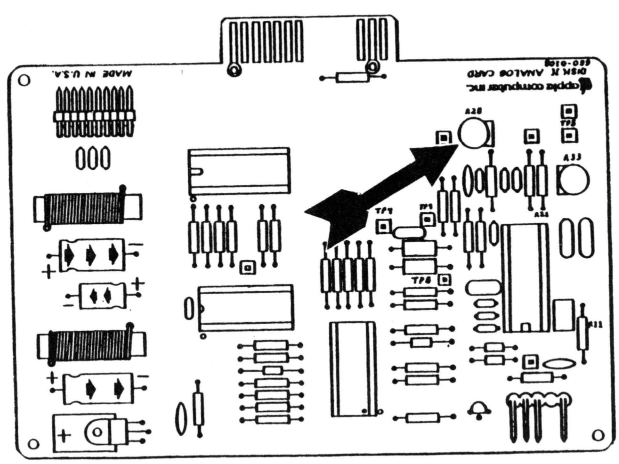
~~Change to stop~~ + ~~change f. to~~ .1 µS

15. Change the oscilloscope's sweep speed to 1 uSEC/DIV.

16. Move the scope probe tip to TP7. Adjust the trigger LEVEL control to get a clear display. The pulses at this point should have no dual images on the rising and falling edges (though a certain amount of jitter will be present).



16. If necessary, adjust potentiometer R28 on the analog card until there is a single, stable image with a minimum of jitter.



17. After you have made the adjustments, turn the Apple][off. Then disconnect the customer's drive, apply Glyptol to the potentiometers, and re-assemble the drive.

This completes the Comparator Offset adjustment procedure.

If you were unable to make the adjustments, replace the Analog board and run the test again.

Disk][Technical Procedures

Section 4

Troubleshooting

Contents:

Disk][Troubleshooting Chart

Symptom	Probable Cause
Disk][will not boot; drive comes on. System gives I/O errors during normal operation.	1) Dspeed 2) Head Dirty 3) Interface Cable 4) Disk Analog card 5) Disk Mechanical
Disk][will not boot; drive does not come on.	1) Interface Cable 2) Disk Mechanical 3) Disk Analog card
Disk][makes high pitched whining sound.	1) Disk Mechanical
Disk][writes when diskette is protected.	1) Write Protect switch alignment 2) Disk Analog card
Disk][reads but does not write.	1) Disk Analog card

Disk ///

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TECHNICAL PROCEDURES

EXTERNAL DISK DRIVE ///

TAKE-APART AND ADJUSTMENTS

Contents

A. INTRODUCTION

When data cannot be written to or read from a diskette in the external drive, it may mean that the drive needs adjustment. This module describes how to disassemble and adjust the drive and gives you the opportunity to practice the procedures involved. At the end of the job aid is a Disassembly/Assemblly Checklist for the external Disk Drive /// (Disk ///).

The Disk /// is disassembled in three phases: first the cover, then the metal shield and ribbon cable, and finally the analog card. Assembly is just the reverse. After you disassemble the Disk ///, you will adjust or replace several parts, including Guide, Collet Hub, Head Load Button, the D-Speed and Write Protect switch. These procedures are the same as for the Disk][.

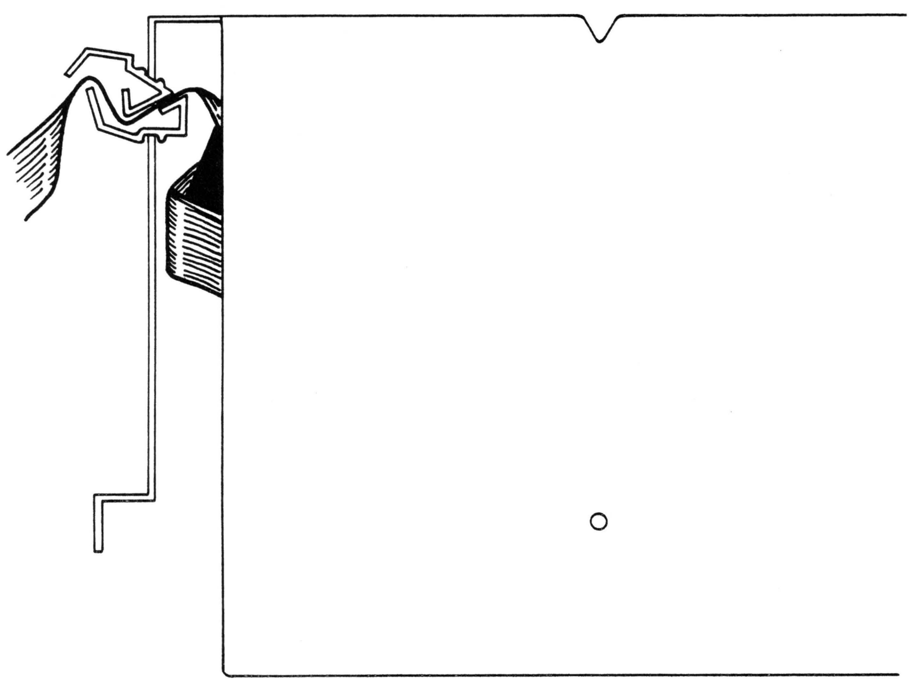


FIGURE 1

B. REMOVING THE COVER

1. Turn the power off on the Apple ///.
2. Unplug the external disk drive from the rear connector of the Apple ///. Be sure to check if there are any screws securing the connector before pulling on it. Pull by the connector rather than by the cable.
3. Unplug any other daisy-chained drives from the rear panel of the drive to be disassembled.
4. Close the disk door on front of disk drive unit.
5. Turn the drive over with the bottom-side up and remove the four Phillips screws.
6. Lift the bottom cover up from the rear and remove it. Turn the unit top side up.
7. Remove the single Phillips screw from the back panel.
8. Holding on the bottom front of the top cover, pull the cover slightly forward and up until it clears the interior parts of the drive. Set cover aside.

C. REMOVING THE RIBBON CABLE

9. Remove the four Phillips screws holding the metal shield to the drive chassis.
10. Remove the flat cable from the back of the drive by pressing the strain relief (Figure 1) out of the slot and removing the cable. Slip a screwdriver inside the metal shield and pry down on the strain relief while simultaneously pulling down and out from outside. Be sure not to crush the cable when prying the strain relief. (Large pliers can be used to compress the strain relief enough to separate it from the mounting bracket.) The relief will come apart in two pieces. The strain relief can be a real bear, so be persistent!
11. Slide the metal shield cover back and off the drive, being careful not to pull on the cable as it is still connected to the analog card.

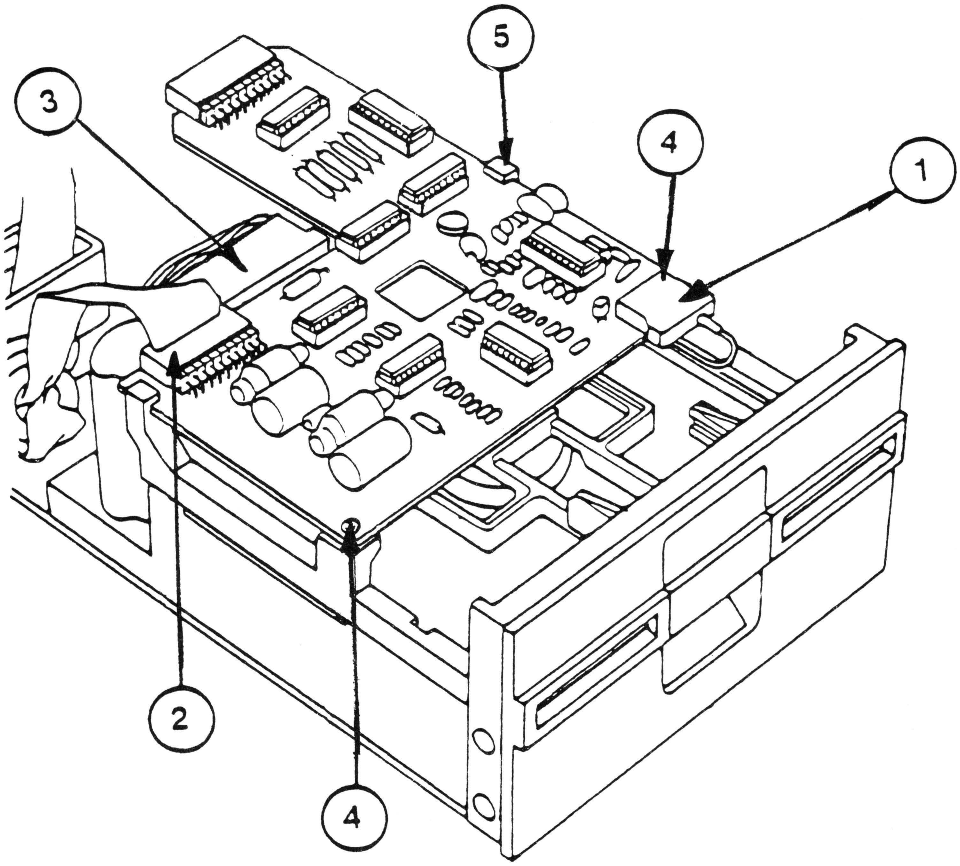


FIGURE 2

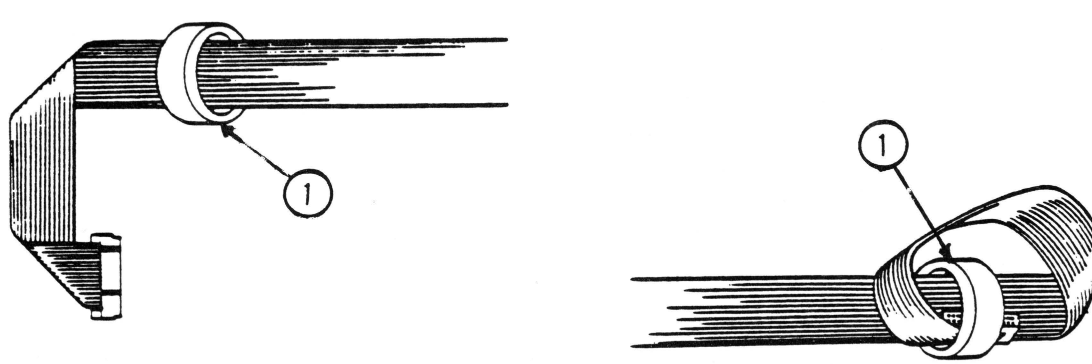


FIGURE 3

12. Lift up on the connector retainer of the board plug (Figure 2,#3) and remove the plug.

13. Remove the ribbon cable connector from the analog card (Figure 2,#2). It might be fastened very securely, so grasp the connector and pull back firmly until it disconnects. It may help to wiggle it gently back and forth as you pull back, but be careful not to bend the connector pins.

14. When replacing the ribbon cable, twist the cable connector slightly, push it through the toroids and remove the toroids from the cable (Figure 3,#1).

D. REMOVING THE ANALOG CARD

15. Remove head molex plug from front of analog card (Figure 2,#1).

16. Remove the two screws at the front of the analog card (Figure 2,#4).

17. Slide analog card forward past the retaining slots at the rear and then lift out (Figure 2,#5).

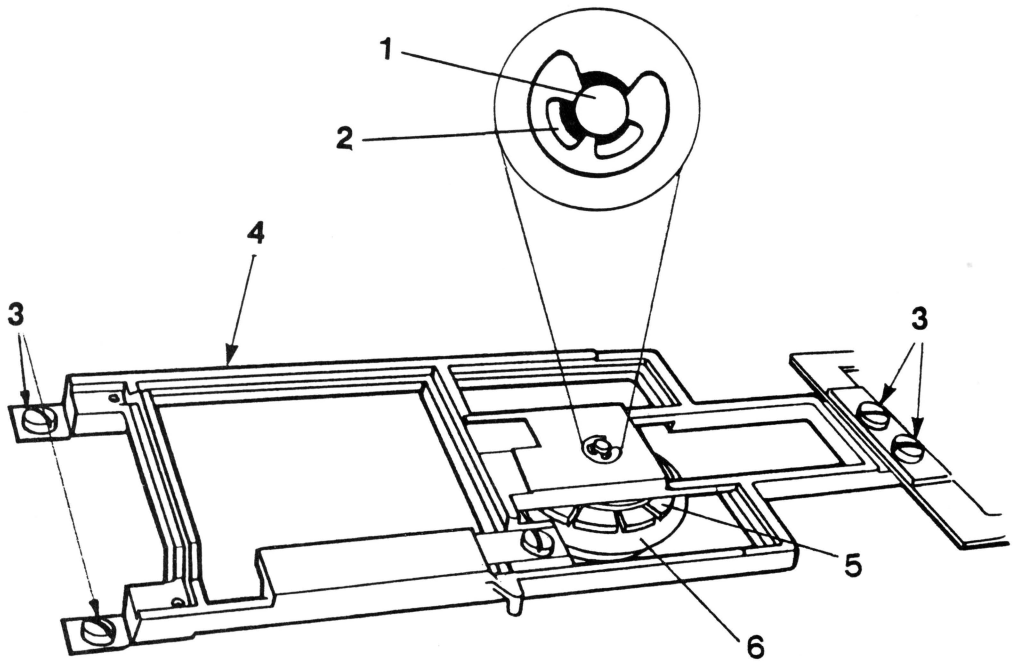


FIGURE 4

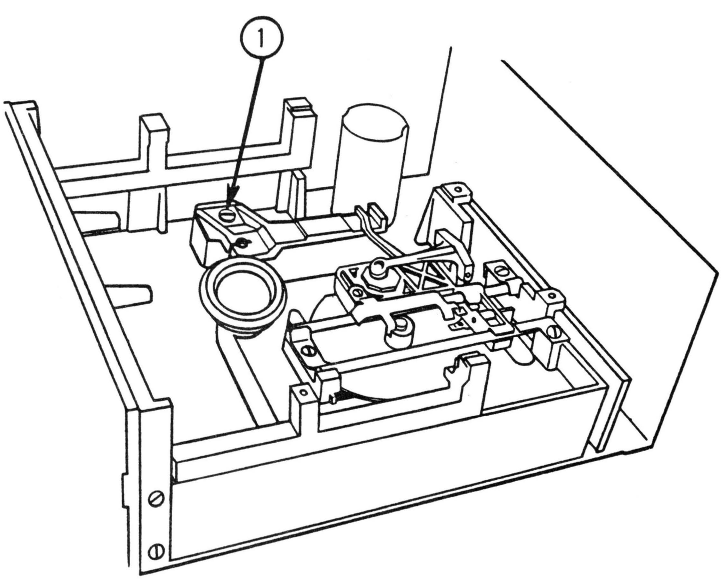


FIGURE 5

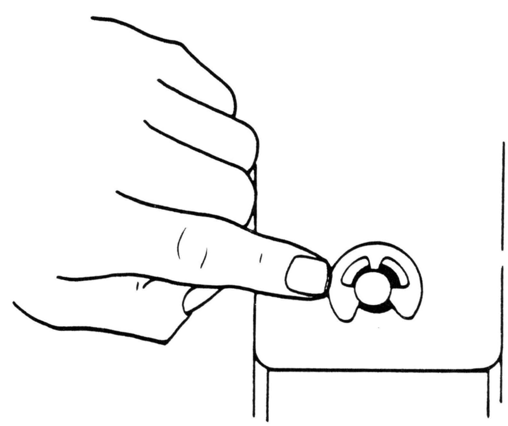


FIGURE 6

E. DISKETTE STOP GUIDE ADJUSTMENT

NOTE: It is almost never necessary to adjust the diskette stop guide. In fact, on some models the diskette stop guide (a black plastic gadget) has been eliminated and the stop is a part of the casting itself. Still, they get tinkered with, and when they are out of adjustment, the diskette can be so far off-center that the collet hub can't find center as it seats. This damages the diskette.

1. With the Disk Adjustment Tool centered, observe the Collect Hub (Figure 4,#5).
2. If tool cannot center properly because stop guide is too far forward, loosen stop guide mounting screw (Figure 5,#1), accessible through small round hole on left side of the tool, and allow guide to move back.
3. Center tool correctly and gently close the drive door.
4. Adjust stop guide so that it touches tool, then tighten mounting screw.
5. To adjust the Collet Hub look straight down on collet shaft, (Figure 4, #1) and close door. Check to see that shaft is centered.
6. Open and close door again, to see that the collet hub moves cleanly into the center of its receptacle.
7. Loosen four screws--two on back of bracket and two that hold bracket to door (Figure 4,#3).
8. Close door, ensuring that collet hub (Figure 4,#5) is seated in its receptacle (Figure 4,#6).
9. Looking straight down on collet shaft, move bracket around until shaft is centered in hole (Figure 4,#2).
10. Tighten rear screws.
11. Check by repeating STEPS 6 and 7.
12. As a further check, open the door and then push collet shaft off-center, (Figure 6), close and open door a few time, making sure that shaft reseats itself in the center of the hole.
13. Adjust the drive door if necessary (procedure follows).

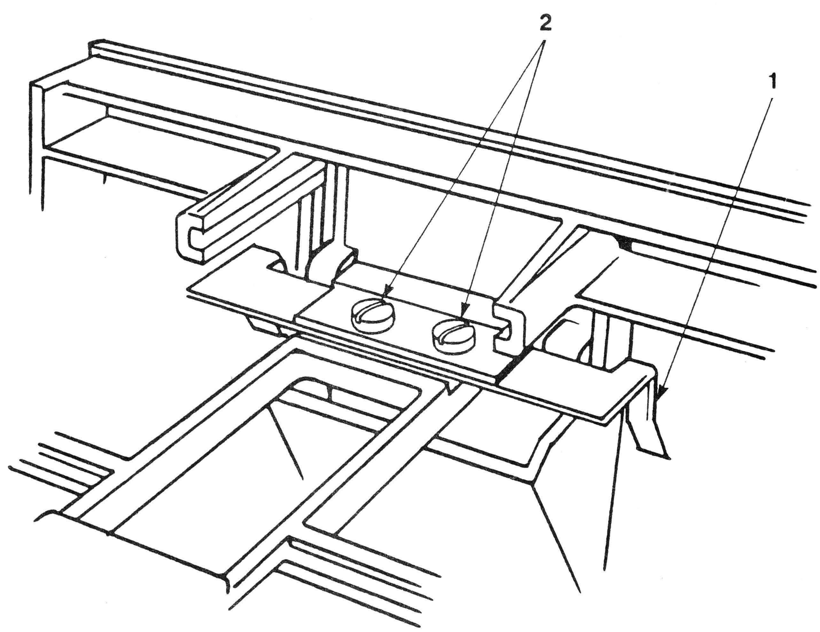


FIGURE 7

F. REPLACING AND ADJUSTING THE DRIVE DOOR

1. Remove two screws on each side of the front bezel (front panel) of the unit.

2. Tilt the bezel forward.

3. Remove the two screws holding the door in place and remove the door assembly.

4. Set the new door in place noting the position of the door guides (Figure 7,#1) and snug the screw to hold it in place.

5. Replace the bezel and hold it in place.

6. Insert Adjustment Tool into the drive and allow it to center properly.

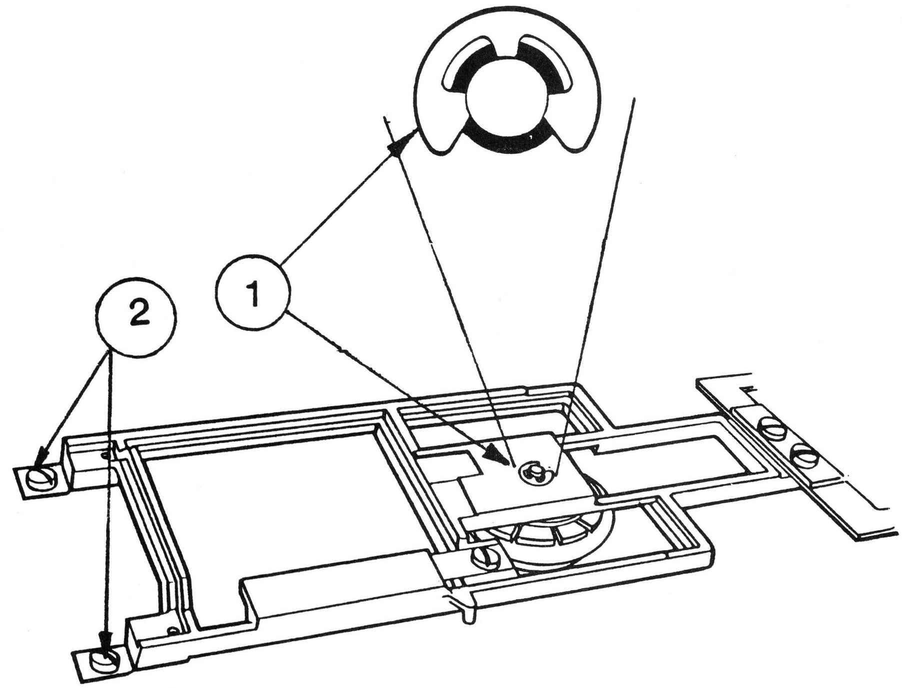
7. While gently closing the drive door, observe the two guide bars (Figure 7,#1), which are visible when viewed from the back of the drive looking towards the front. There should be no binding between the guides and tool.

8. If there is binding, or if the door is crooked, tilt the bezel forward just enough the to be able to loosen the two screws that hold the door in place. Make sure the two plastic protrusions on the top of the door fit into the two plastic guides on the bezel and that the door looks centered.

9. With the bezel tilted forward, tighten the two screws to hold the door into position.

10. Put the bezel into its normal position and replace the four screws to hold it.

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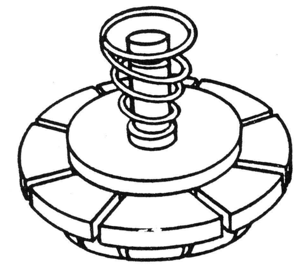


FIGURE 9

FIGURE 8

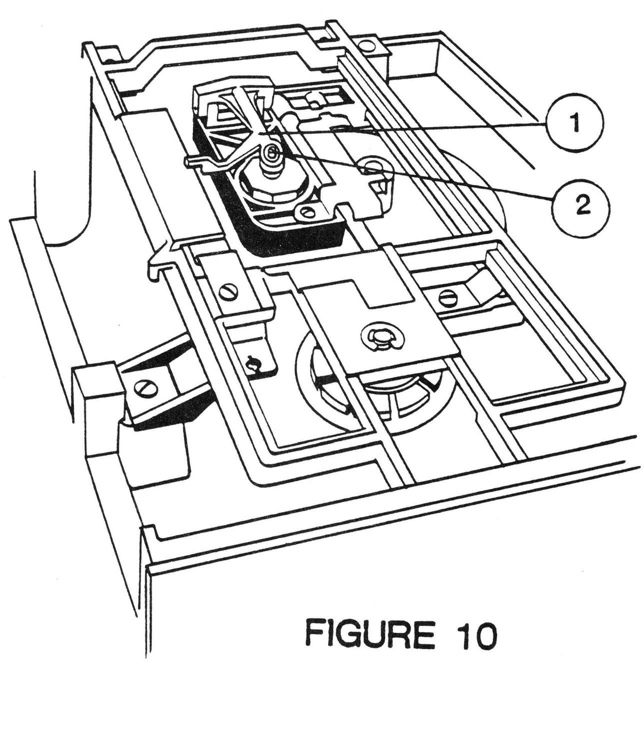


FIGURE 10

G. REPLACING THE COLLET HUB

1. Open the drive door.

2. Remove the two screws at the rear of the assembly (Figure 8,#2) that hold the bracket in place and remove it.

3. With a screwdriver pry the retaining clip (Figure 8) from the shaft holding the collet.

4. Remove the collet hub assembly and retain the spring and washer (Figure 9). Remove spring carefully, taking care not to stretch it.

5. Place the washer and spring on the new collet shaft--the spring goes on small end down--and insert into the mounting arm.

6. Install the retaining clip.

7. Set the bracket into position (Figure 8), making sure the two plastic protrusions on the top of the door slide into the guides on the bezel.

8. Push down on the collet hub to make sure it is centered, then secure the two screws to hold the bracket in place (Figure 8,#2).

H. REPLACING THE HEAD LOAD BUTTON

NOTE: Some Head Load Buttons are glued. If the glue cannot be broken, sent the unit to Level 2 for servicing.

1. Lift the Head Load Arm up (Figure 10,#1) and squeeze the top part of the load button (Figure 10,#2) with thin needle-nose pliers and drop button down.

2. Install a new load button by inserting it into the holder and pushing up until it snaps in place.

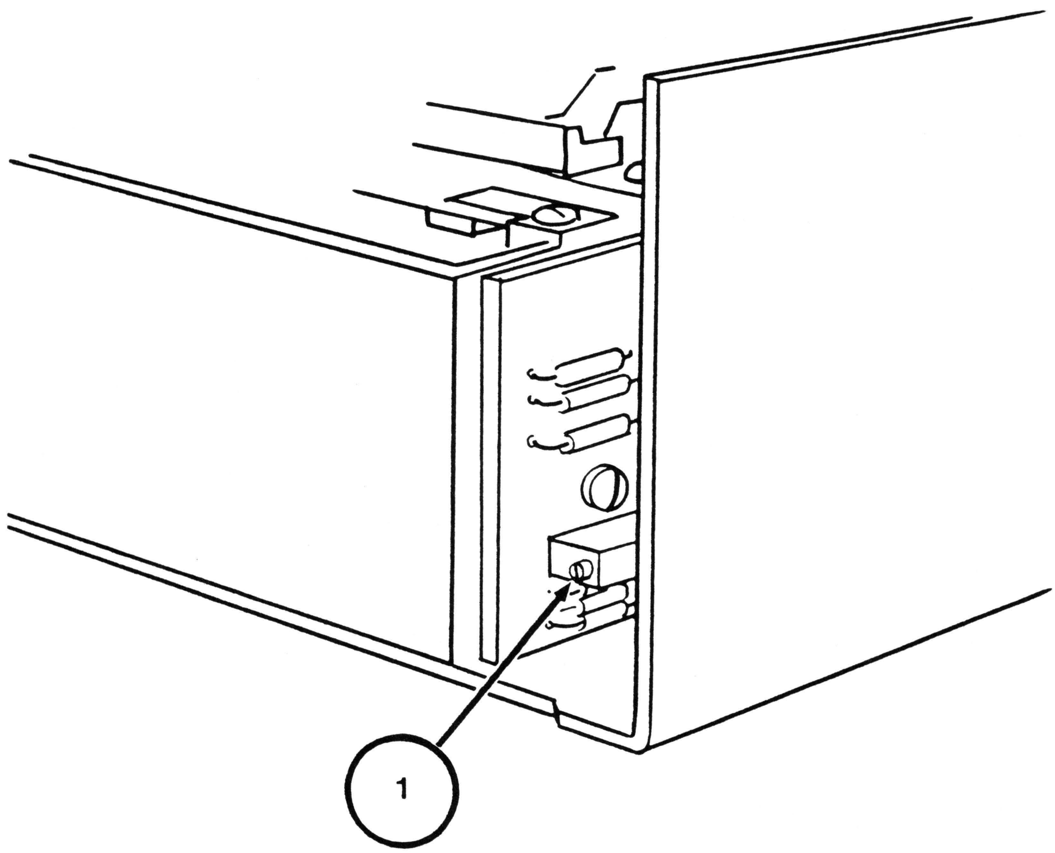


FIGURE 11

I. ADJUSTING THE SPEED -- THE D-SPEED TEST

1. Check that the power to the Apple /// is off.

2. Place the Apple][Emulation diskette in the internal drive (assuming it is working properly) and boot it up by turning the power on.

3. To the prompt "Boot Apple][Disk", place the Disk Alignment Aid diskette in the internal drive and hit return.

4. When the menu comes up, SET TARGET DISK will be highlighted. Accept it by pressing **A**.

5. Set target for drive 6, slot 2, by pressing **SAA**. Press ESC.

6. Select DSPEED test (press **SSSA**).

7. The screen will warn you that the test will write on the diskette. Put your scratch (or a blank formatted) diskette in the target drive and press A again.

   NOTE: At this point, the screen should show a scale with -100 on the left and +100 on the right, with a marker indicating the relative speed of the drive.

8. Look at the back of the drive mechanism. Locate the Motor Control Card, mounted on the edge, and note the small grey helipot with a screwdriver adjustment on the side (Figure 11,#1).

   NOTE: Do not confuse this with the helipot(s) on the analog card!

9. With a small flatblade screwdriver adjust the helipot and note how the indicator on the screen moves back and forth, showing changes of speed.

10. Set the speed so that it indicates between -5 and 0.

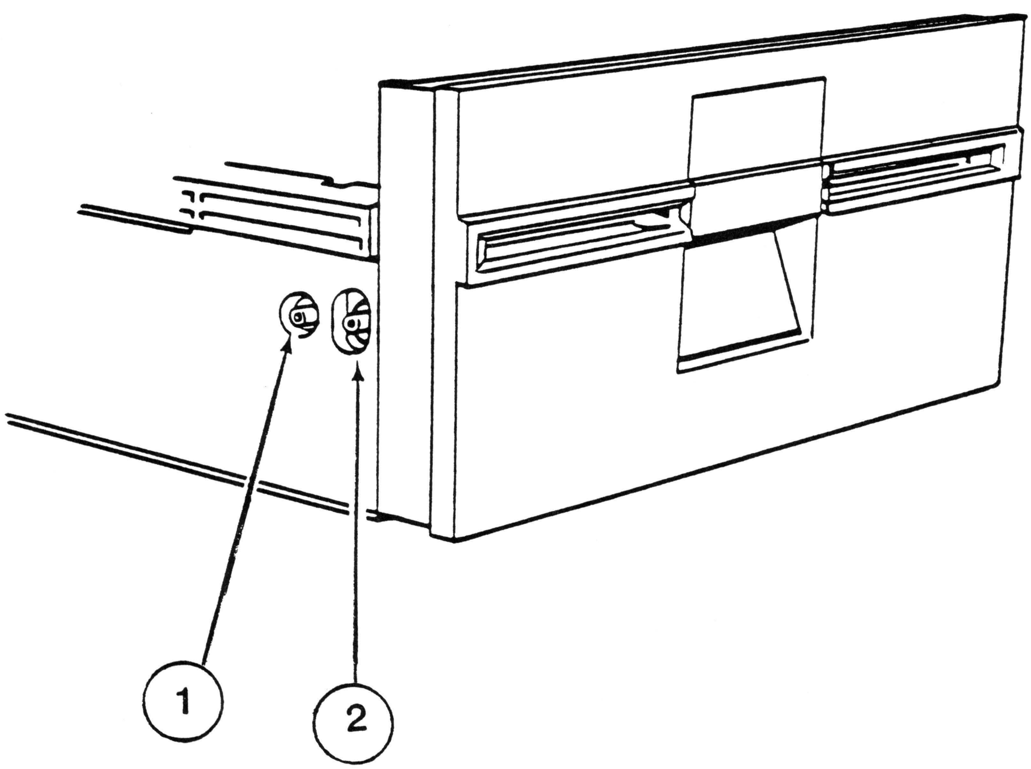


FIGURE 12

J. WRITE PROTECT SWITCH ADJUSTMENT

1. Using the same set-up you had for the previous exercise, select WRT PROTECT SWITCH.

2. Note the two setscrews holding the write-protect switch in place (Figure 12,#1 & 2). The switch is located on front left side of housing as you face drive door. The far setscrew, (Figure 12,#1), forms a pivot for switch; the near setscrew (Figure 12,#2), sets switch position.

3. Insert Disk-Adjustment Tool all the way and leave the disk drive door open.

   NOTE: Some drives will scrape on the adjustment tool. If you have one that does, use a diskette instead of the tool.

4. Loosen the rear setscrew, then loosen the front setscrew and raise up on it (Figure 12,#2) until the switch disables, and tighten setscrew.

5. Tighten rear setscrew (Figure 12,#1).

6. Check by withdrawing Adjustment Tool to the Slot 1 position. Switch should be enabled.

   NOTE: If switch continues to show a disabled condition, reboot and try the procedure again.

7. Verify again, using Adjustment Tool in both Slot 1 and Slot 2 positions.

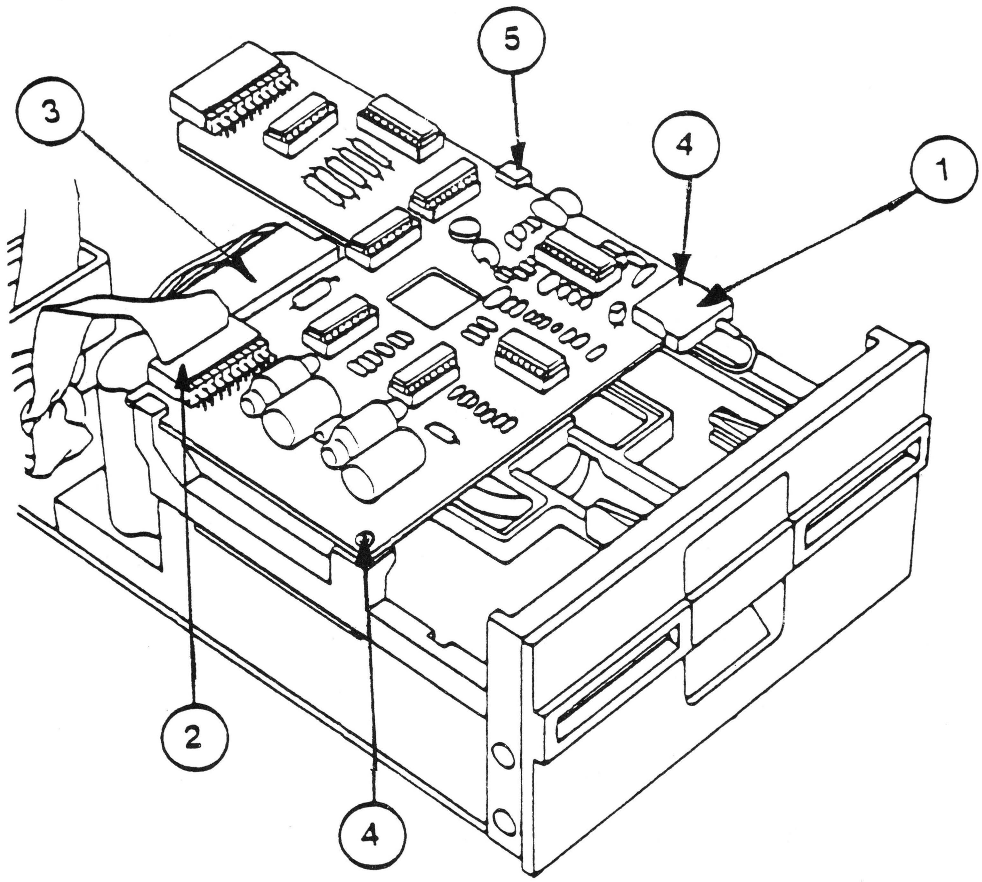


FIGURE 13

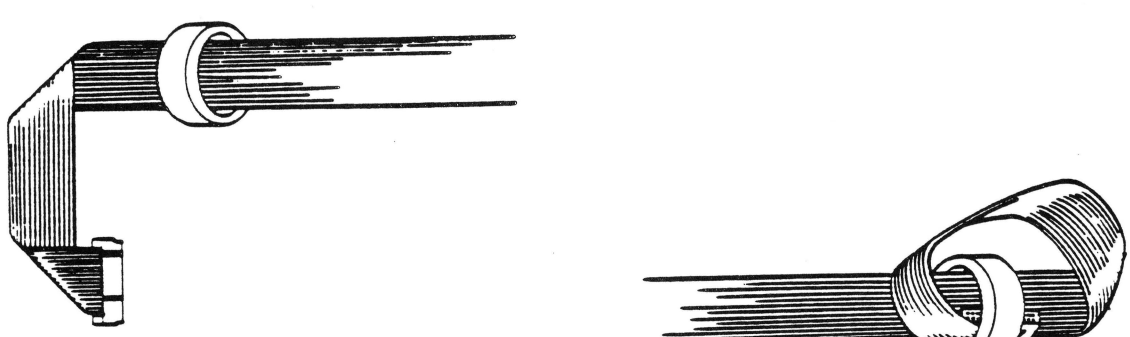


FIGURE 14

K. REPLACING THE ANALOG CARD

1. Slide the analog card through the retaining slots (Figure 13,#5) and into position.

2. Replace two screws to hold board in place (Figure 13,#4).

3. Attach the head molex plug to the front of the analog card (Figure 13,#1). Ensure that there is just enough loop in the cable so that it doesn´t pull down on the head molex plug.

L. REPLACING THE RIBBON CABLE

4. Place the two toroids onto one end of the replacement cable looping the cable through the toroids and leaving about 3 inches of cable between the toroids and the connector (Figure 14).

5. Place the cable just above the toroids into the nylon cable holder and snap the holder shut.

6. Attach the ribbon cable connector to the analog card, making sure that both rows of pins align with the holes in the connector (Figure 13,#2).

7. Attach the analog card board plug at the end of the analog card (Figure 13,#3). The gripper of the retainer will slip into the hole when it is in place.

8. Replace the strain relief guard at the back of the metal shield. Fit the guard as close as possible to the toroid while leaving yourself enough cable to work with. Make an "S" in the cable right next to the metal shield. Fit the bottom portion of the "S" into the one part of the strain relief with the triangle side fitting inside the metal shield. The other part of the strain relief fits with the triangle against the cable and into the lower portion of the strain relief. The top part then slips inside the metal shield (Figure 15).

9. Replace the four screws on the side of the metal shield.

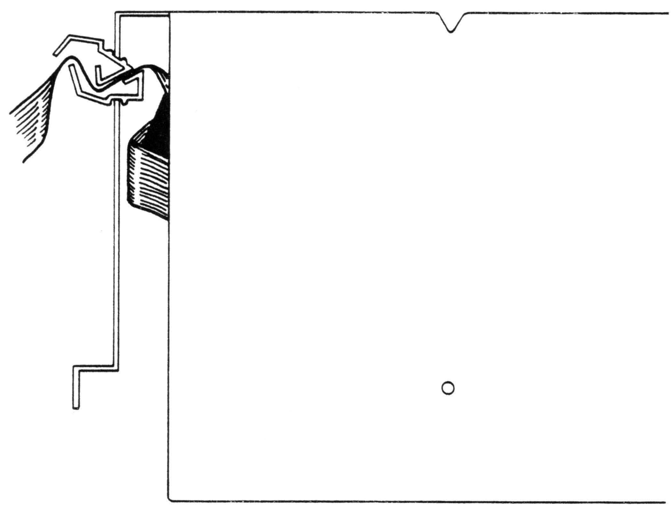


FIGURE 15

M. REPLACING THE COVER

10. Replace the top cover. With the unit top side up, set cover over back edge of Disk /// then pull the cover slightly forward as you slide it down over the disk drive door.

11. Replace the single Phillips screw on the back panel.

12. Turn the drive over and replace the bottom cover.

13. Replace four Phillips screws and turn drive top side up.

14. Reconnect any daisy-chained drive on the rear panel of Disk ///.

15. Reconnect Disk /// on the rear panel of the Apple ///.

N. DISASSEMBLY/ASSEMBLY CHECKLIST

Disassembly Procedures

____ 1. Turn the Apple ///'s power off.
____ 2. Unplug the disk drive from the rear connector of the Apple ///.
____ 3. Unplug any other daisy-chained drives from the rear panel of the drive to be repaired.
____ 4. Remove disk drive cover.
____ 5. Remove strain relief.
____ 6. Remove metal shield.
____ 7. Disconnect head molex plug, board plug and ribbon cable connector from the analog card.
____ 8. Remove analog card.

Adjustments

____ 1. Replace/Adjust disk drive door.
____ 2. Adjust diskette stop guide.
____ 3. Replace collet hub.
____ 4. Replace head load button.
____ 5. Adjust the speed.
____ 6. Adjust write protect switch.

Assembly Procedures

____ 1. Replace analog card.
____ 2. Connect head molex plug, board plug, and ribbon cable connector on the analog card.
____ 3. Replace metal shield.
____ 4. Replace strain relief.
____ 5. Replace disk drive cover.
____ 6. Connect any daisy-chained drives to the rear panel of the drive.
____ 7. Connect the disk drive to the rear connector of the Apple ///.

ProFile

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ProFile Technical Procedures

Apple /// ProFile Limited Data Recovery and Exchange

Contents:

Section 1

Section 2

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ProFile Technical Procedures

Section 1

Apple /// ProFile Limited Data Recovery

Contents:

A. INTRODUCTION

This ProFile Limited Data Recovery Program is used with Apple /// ProFiles. It attempts to copy customer's files from a damaged ProFile to the exchange unit. Although there is no guarantee that data can be transferred, in most cases data recovery is possible if the ProFile passes the self test after being turned on.

If the ProFile READY light does not come on to a steady state, data cannot be recovered using this program. Special arrangements must be made with Level 2 for data recovery.

The importance of regular backups should be emphasized to the customer. The customer should have a copy of the Backup /// diskette (part number 681 0032). The documentation for this is "Apple /// Backup User's Manual" (part number 030 0381).

CAUTION: Before continuing with this procedure use the "Apple /// Confidence Program" (part number 681 0031) to ensure that the Apple /// is functioning properly. Failure to do this could possibly damage the ProFile!

B. WHAT YOU SHOULD DO FIRST

First run the confidence program and make sure that the Apple /// is functioning properly. Then make a back-up copy of the Recovery Program diskette! You will be using a system with known bad hardware attached to it, so don't take a chance of destroying the software accidentally. Put the original in a safe place.

C. SOFTWARE OVERVIEW

The diskette accompanying this document contains software designed to recover a large portion of data found on a damaged ProFile. In order to use this program the customer's ProFile must complete the power-up cycle, which includes a testing sequence. That is, the red "READY" indicator must be on and steady. If this does not occur, data recovery is not possible.

The program copies data from the customer's ProFile to the exchange unit. If the program has difficulty writing to the Exchange ProFile, it should stop. Something could be wrong with the Exchange unit, so try another Exchange unit. As data is copied, those blocks which the program had problems reading are identified. After the blocks are copied, all further operations are performed on the exchange unit.

The program examines each file to see if any of its blocks were among those which couldn't be copied. A printed record indicates the files that couldn't be copied as being suspect and, most probably, unusable. While this is going on, the master allocation map for the entire ProFile is also being rebuilt. The allocation map tells which blocks are used and which are free for use.

Our testing has shown that of the ProFiles that become "READY", the program is able to recover most all of the customer's data.

D. EQUIPMENT REQUIRED

Recovery Program Diskette
Apple /// System (256k)
Monitor
Compatible Printer
Printer Interface Card (if not using the Silentype printer)
ProFile Interface Card (2 required)
ProFile Interface Cable (2 required)

E. CONFIGURING THE SOFTWARE

The Recovery Program software is configured for two ProFile drivers and the Silentype printer. If you use the Silentype printer no configuration is necessary. If you wish to use a printer which uses the built-in serial port or an interface card, use the System Configuration Program to add the appropriate driver. (Refer to the Standard Device Drivers Manual.) Delete the .PRINTER driver already configured. Whatever printer driver you use must be named **.PRINTER** as the program looks for this name for its output.

Do not under any circumstances, make any changes to either of the two ProFile drivers. These are named **.GOOD** and **.BAD**, and must remain that way for the program to run correctly.

When you have the software properly configured, make another copy and use it as your working diskette. There is really no point in taking the chance of destroying the one you just configured.

F. SETTING UP THE SYSTEM

1. Turn the power off on the Apple /// and remove the cover.

2. If necessary, install an interface card for the printer in the slot for which you configured its driver.

3. Configure the Apple /// with two ProFiles as follows: Install the ProFile interface cards in slots three (3) and four (4). These are the two right-most slots as you look at the Apple from the keyboard side. Seat the cards firmly in the slots.

4. The ProFile Electronic Module contains two circular markers, one red and one green. Place the red marker on the cable connected to the ProFile card in slot 4. Place the green marker on the cable connected to the card in slot 3. (Addition markers are included in the software package.)

   NOTE: You can leave this set-up and whenever you want to use the data recovery procedures all that is necessary it to connect the ProFiles (see next section).

5. Connect the printer and monitor.

G. RUNNING THE PROGRAM

NOTE: Before you running the Limited Data Recovery Program, attach the LED to the Exchange ProFile. (See Section 2 for directions.)

1. Turn on the monitor.

2. Turn on the printer and make sure it is on-line.

3. Connect the (good) Exchange ProFile to the cable marked with the green marker.

4. Connect the customer's ProFile to the cable marked with the red marker.

   CAUTION: Check that the cables are connected correctly or you will copy files from the Exchange ProFile to the customer's, eliminating any chance of saving any files.

5. Connect the power cables to both ProFiles and turn them on.

6. Wait until the "READY" lights on both ProFiles show steady red. This will take a minute or so.

7. Place the Recovery Program Diskette in the Apple /// built-in drive.

8. Turn on the Apple /// and the program will start.

9. When the program starts you will see the message:

   Watch the ready light on the EXCHANGE ProFile.
   Please press the RETURN key when you're ready.

   When you press RETURN, the READY light on the Exchange ProFile should flash once, indicating that the cables are connected correctly.

   If the light does not flash, you may have connected the cables incorrectly. Press the ESCAPE key (to prevent the recovery process), check the cables and try again.

10. As a final check, you will see the following displayed:

    Are you sure you want to overwrite PROFILE? (PROFILE is the name of the Exchange ProFile.)

    Enter "Y" if the ready light flashed, or
    ESCAPE if the ready light did not flash:

    Answer yes by entering a **Y** to begin the recovery process.

11. An asterisk (*) in the upper right hand corner of the screen will blink to indicate that the recovery operation is working correctly. During the operation, different messages will appear on the screen to let you know what is happening within the program. The operation can take anywhere from 15 to 30 minutes, depending upon how much data can be recovered.

12. As sections of the program are completed, messages will be listed to the printer.

13. When the program is done, the Apple bell will beep about every five seconds. Press the ESCAPE key to stop the bell and the program.

14. Power down both ProFiles. The exchange unit goes to the customer, and the other unit goes to Level 2.

15. Turn the equipment off, remove the program diskette and put it away.

H. INTERPRETING THE RESULTS

Give your customer the printed results of the data recovery procedures and a copy of how to interpret these results. In the following explanation, examples of the printout are shown in bold face printing. These statements are interpreted as follows:

Apple /// Limited Disk Recovery Program
Results:
Trouble accessing **0 blocks** (a number other than 0 might appear)

All accessible directories are listed below. Individual files which contain problem blocks are also listed.
The resolution of the individual files on the ProFile is shown as a running status, displaying the directory names as they appear on the ProFile. If a file contains one or more "suspect" blocks, its name will appear.

These files are not deleted as they may, in fact, still be partially usable. An example of this would be as ASCII file, such as one created by AppleWriter. An attempt should be made by the customer to access these files. If the attempt results in "unusual" things happening, then delete them.

Block Conflict Report
This message appears if two or more files claim use of the same block .Another pass through the ProFile directories is made to resolve it. Along with this message the directory names are listed on the print-out. Those files which conflict with each other will be listed. An attempt is made to repair the problem. If the conflict is resolved, no further mention is made of the files, otherwise the following message appears: **Unable to repair all block conflict errors. Try your files.**

Summary of Allocation Map Changes
This summarizes the changes made to the master allocation map. This will include the total number of blocks available on the ProFile (**blocks on volume**), the number of blocks in use (**blocks used**), and the number still available (**blocks available**).

Block(s) released from allocation map
A statement will also appear regarding the number of blocks, if any, released from the allocation map. If blocks were released, the original allocation map "thought" that more blocks were in use than really were. The ProFile returned to your customer contains the updated, correct allocation map.

ProFile Technical Procedures

Section 2

ProFile Exchange Procedures

Contents:

A. INTRODUCTION

When a customer returns a ProFile for servicing, the unit will be exchanged for a spares kit ProFile. Before you exchange the customer's ProFile, run the Limited Data Recovery program (described in Section 1) if there is data the customer wishes to try to recover. Exchanging the ProFile consists of removing the cover, the L.E.D. Cable Assembly and rear plates from the customer's ProFile, then replacing the LED assembly and placing the rear plates and the customer's cover on the Service Spares Kit (Exchange ProFile) unit.

The shipping cover marked "SHIPPING FIXTURE" is attached to the ProFile to be serviced and the entire unit is placed in the same packaging as was the spares kit, and sent back for servicing.

B. MATERIALS REQUIRED

Diagonal cutters ("dikes")
Tie Wraps
Medium Phillips Screwdriver
Protective Pad
Small Flatblade Screwdriver

CAUTION: The ProFile is a mechanical device with motors and moving parts. Rough handling such as dropping the drive, sharply jarring it or allowing heavy objects to fall on it can cause a malfunction. Whenever it is necessary to turn the ProFile over, be sure to rest it on a protective pad.

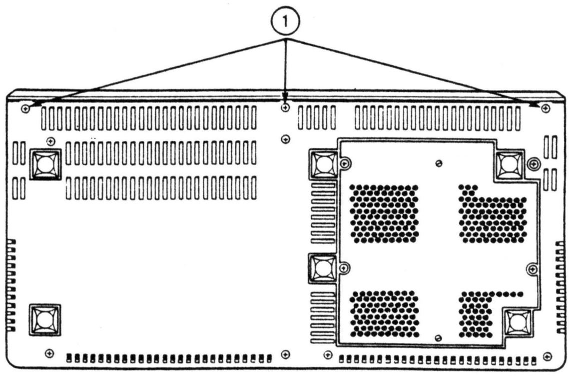


FIGURE 1

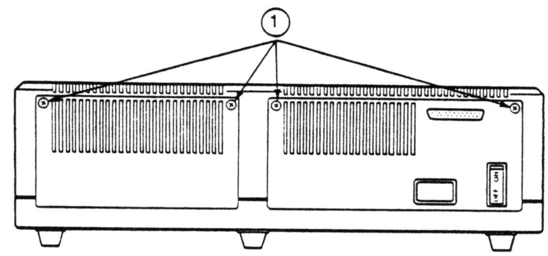


FIGURE 2

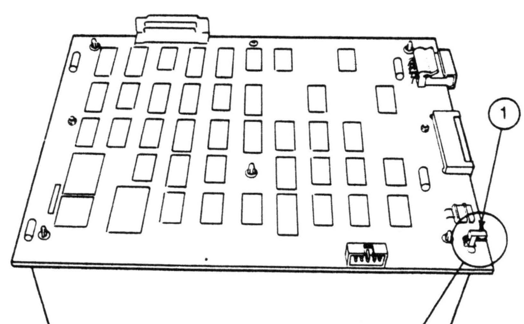


FIGURE 3

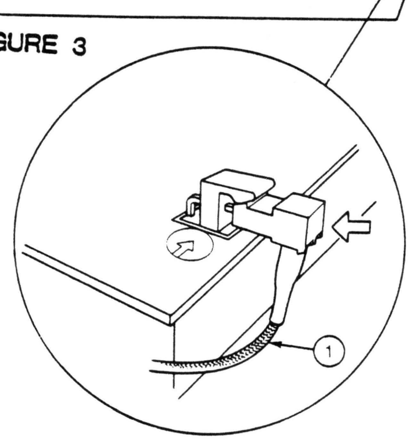


FIGURE 4

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C. REMOVING THE COVER

1. Make sure the customer's ProFile is turned off. Disconnect the power cord and interface cable (ribbon cable) from the back of the ProFile.

2. Turn the ProFile over, lay it on the protective pad, and remove the three Phillips-head screws from beneath the front panel (Figure 1, #1).

3. Turn the ProFile right side up; loosen and remove the four screws on the back of the unit and the two rear plates (Figure 2, #1).

4. Lift the cover off carefully and rest it on the far side of the case, taking care not to pull on the LED cable.

5. Unplug the LED cable from its socket on the controller board (Figure 3, #1).

6. Remove the cover marked "SHIPPING FIXTURE" from the Service Spare parts module. Note the LED assembly is not attached.

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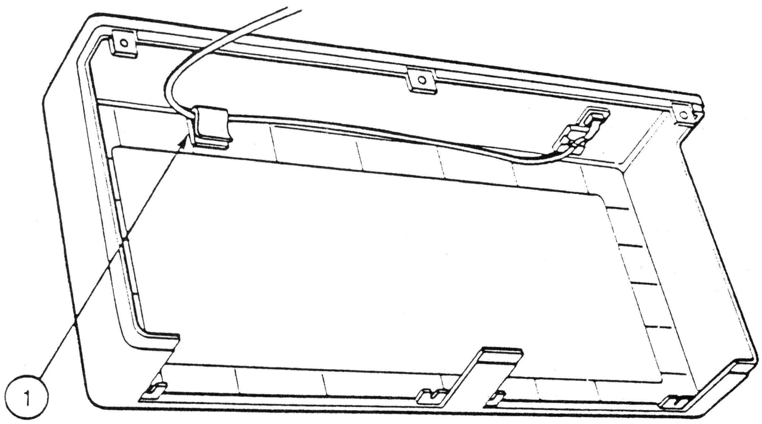


FIGURE 5

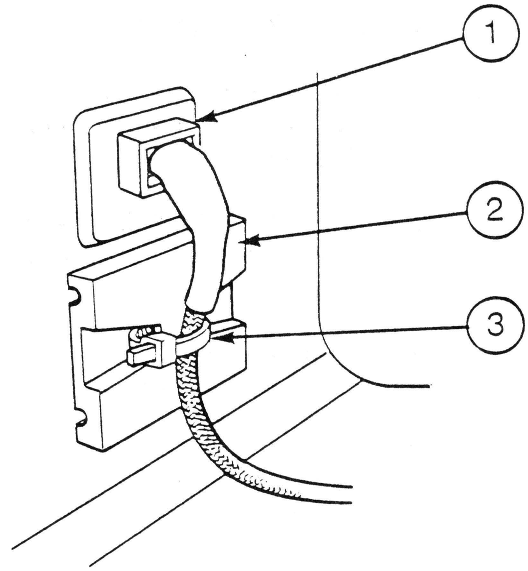


FIGURE 6

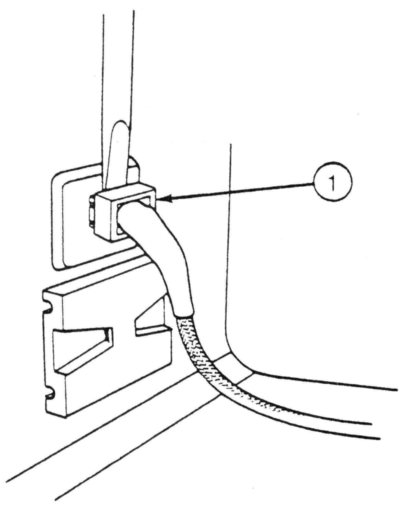


FIGURE 7

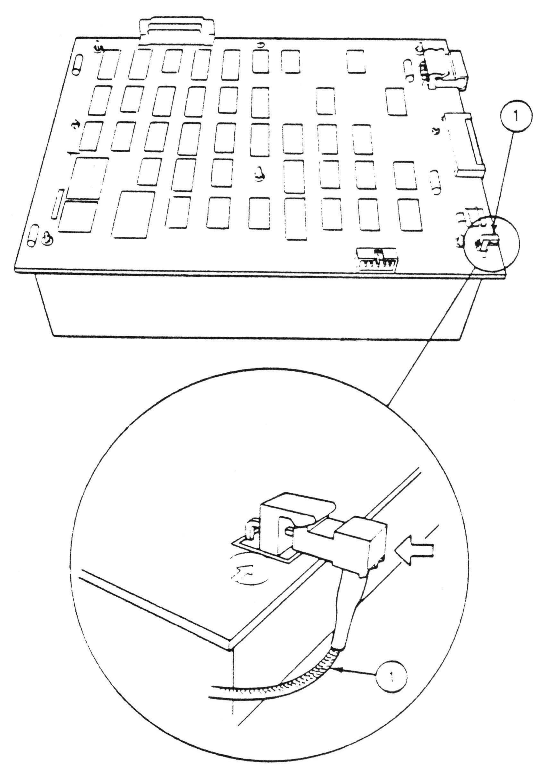


FIGURE 9

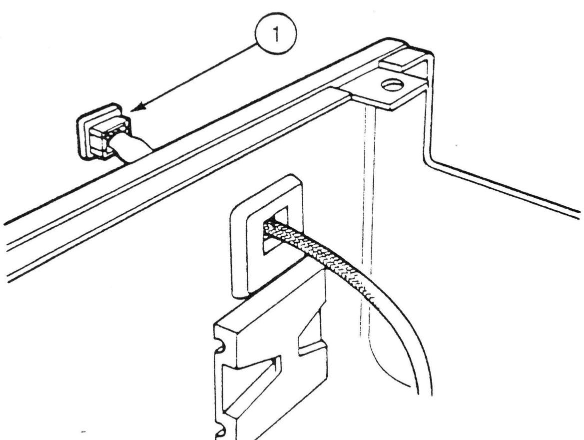


FIGURE 8

D. REMOVING THE LED ASSEMBLY

1. The ProFile cover is removed and the LED cable is disconnected from the controller card.

2. With the customer's cover laying flat, as in Figure 5, cut off the white plastic tie (Figure 6, #3) that holds the LED cable to the white holder in the cover (Figure 6, #2).

3. Remove the other end of the LED cable from the other holder in the cover. (On some ProFiles, this holder will be a clamp like the one shown in Figure 5, #1; on others, it will be like the one shown in Figure 6.)

4. With a flathead screwdriver, pry the cable clamp off the back of the LED (Figure 7, #1) and slide it down the cable, out of the way.

5. Firmly push a few inches of the cable out through the slot in the cover (behind the "Ready" label) as shown in Figure 8. You will have to remove the "Ready" label around the LED opening on the cover to free the LED.

6. Around the red LED is a small black plastic mount. Remove the mount (Figure 8, #1) by pushing out its side flaps and sliding it off the LED.

7. Pull the cable back through the hole in the case.

E. INSTALLING THE NEW LED ASSEMBLY

8. Take the LED from the Service Spares Kit and thread it through the front opening in the cover. Place the small black plastic mount on the LED (see Figure 8, #1), then pull the cable back through the opening until the LED fits in its slot. Replace the "ready" label with the new label found in the spares kit..

9. Push the cable clamp (Figure 6, #1) up to the cover until it holds the cable steady.

10. Place the LED cable against the white plastic holder and fasten it with a tie wrap, contained in the spares kit, (Figure 6, #2 and 3). Cut off excess tie wrap.

11. Place the cable in the other holder (Figure 5, #1), using a tie wrap if necessary. Cut off excess tie wrap.

12. Connect LED cable to controller card (Figure 9). Place Customer's LED Cable Assembly and old "Ready" label in the bag, from which you got the new assembly, to be returned with the ProFile to be serviced. Put the customer's cover on the Spares Kit ProFile.

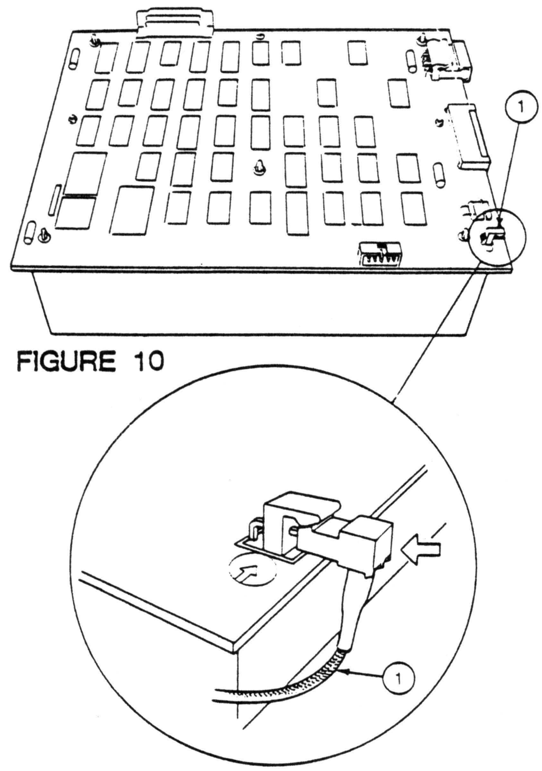


FIGURE 10

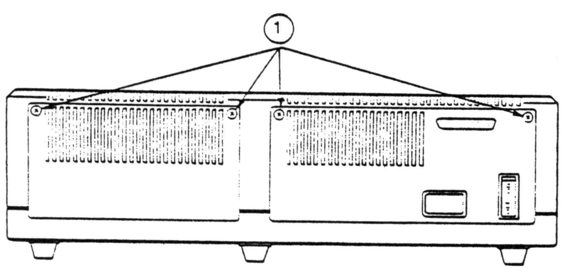


FIGURE 11

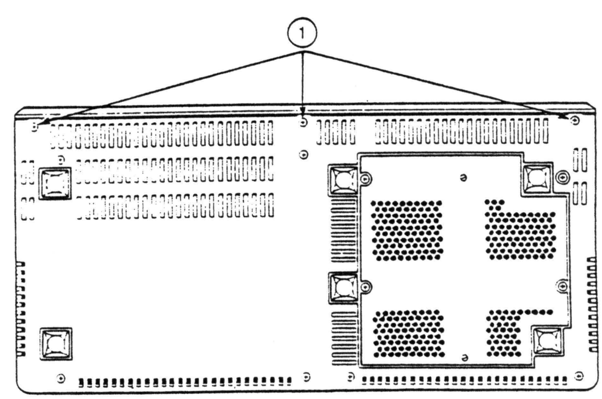


FIGURE 12

F. REPLACING THE COVER AND REAR PLATES

1. Attach the LED cable to its connector on the controller card (Figure 10). Make sure the LED cable exits down and away from the card (Figure 10, #1).

2. Replace the two rear plates and the four screws. Do not tighten the screws at this time (Figure 11).

NOTE: The serial number is stamped on one of the rear plates and must be transferred to the ProFile which the customer will keep.

3. Replace the customer's ProFile cover on to the spares module. (Hint: The four slots on the back of the cover fit between the inner and outer rear plates. Line up the back first; then pull the cover gently forward and down. Check around the cover to make sure the LED cable isn't caught between the cover and the base.)

4. Tighten the four rear-plate screws.

5. Turn the ProFile over and replace the three screws on the front edge (Figure 12).

6. Turn the ProFile right side up. Reinstall the power cord and the interface cable.

NOTE: Before replacing the cover on the unit to be serviced, lay the used LED Cable Assembly from the customer's ProFile on top.

7. Replace the cover marked "SHIPPING FIXTURE" on the unit to be returned for servicing.

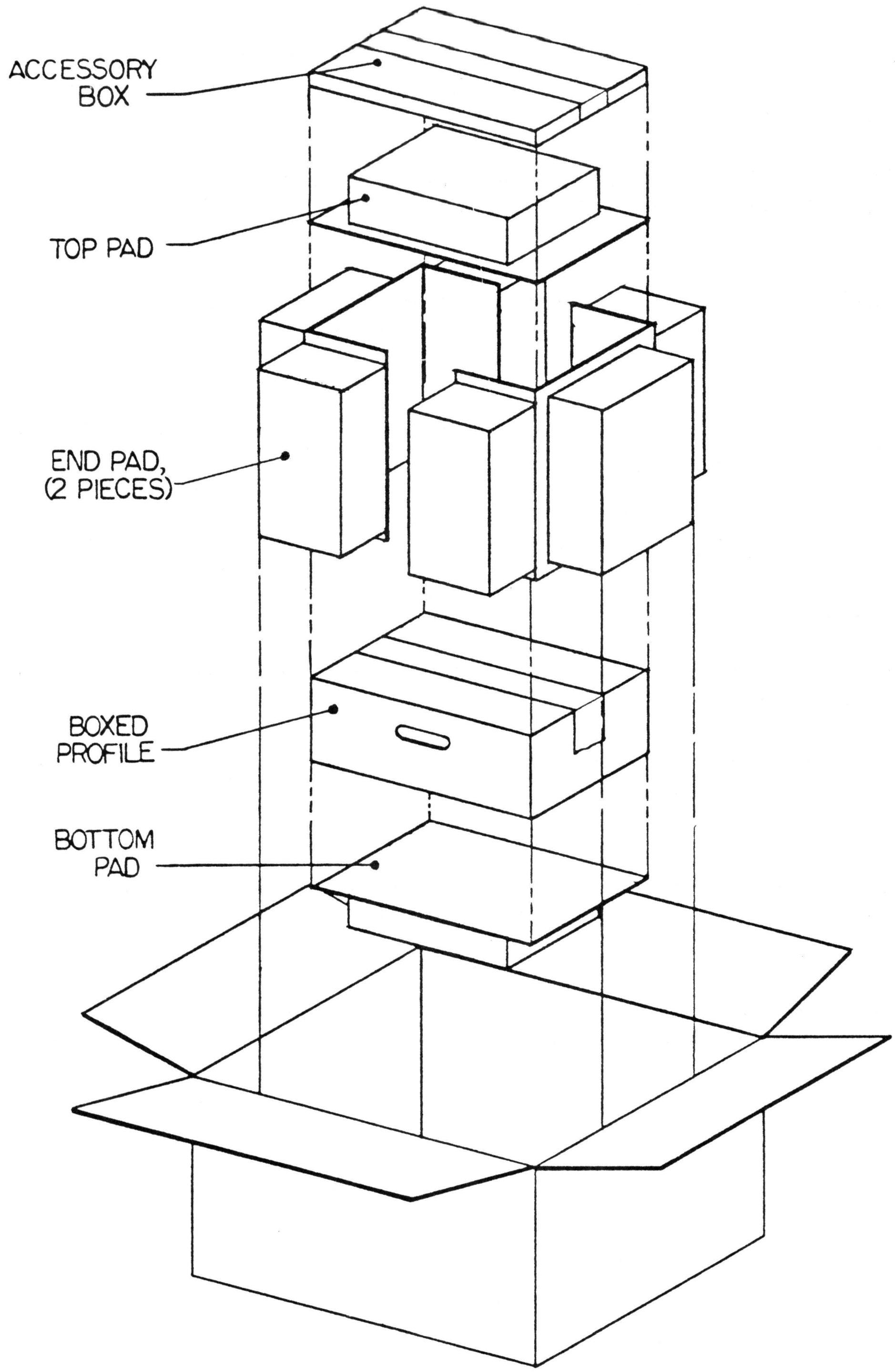

ACCESSORY
BOX
TOP PAD
END PAD,
(2 PIECES)
BOXED
PROFILE
BOTTOM
PAD

FIGURE 13

G. PACKAGING FOR SHIPMENT

The following instructions refer to Figure 13 unless otherwise stated.

1. Set Packing Box on the floor with all flaps facing outside the box.

2. Bend the two End Pads and slide them into the box with the foam against the sides of the box.

3. Slide Bottom Pad, with the foam side toward the bottom of the box, into position between the end pads.

4. Place End Caps snuggly onto the ends of the ProFile (Figure 14).

5. Place the boxed ProFile on top of the Bottom Pad.

6. Lay the Top Pad with the foam padding facing away from the ProFile, on top of the ProFile.

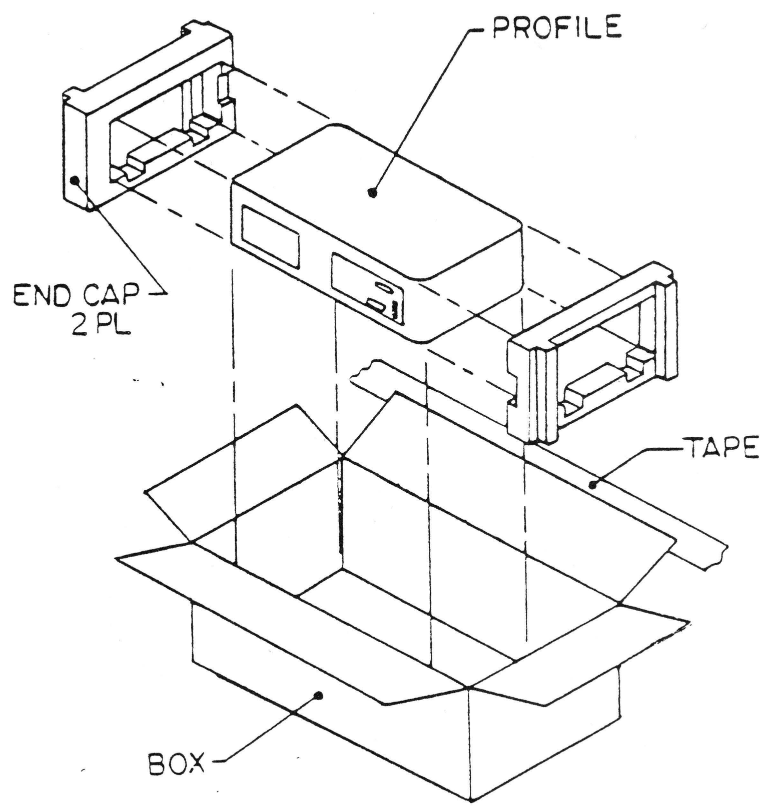
7. Place the Accessory Box, which contains the used LED Assembly, on top of the ProFile.

8. Close the end (short) flaps; then the side flaps.

9. Secure the flaps using shipping tape.

10. Secure shipping documentation to the top of the box.

FIGURE 14



H. SUMMARY OF PROCEDURES CHECKLIST

___ Remove the spares kit from its packaging. Keep the shipping materials to package the unit to be sent in for servicing.

___ Remove cover marked "SHIPPING FIXTURE" from the spares kit and verify that all modules are present, all connections are proper, and that there are no loose or broken wires or foreign materials.

___ Turn on monitor.

___ Turn on printer and make sure it is on-line. (The driver is already configured for the Silentype printer.)

___ Connect LED on Exchange ProFile.

___ Connect Exchange Profile (use slot 3 for the Interface card).

___ Connect customer's ProFile (use slot 4 for the Interface card).

___ Turn on Apple /// and run the Limited Data Recovery program.

___ Power down and disconnect both ProFiles.

___ Remove both rear plates from the customer's ProFile.

___ Remove the cover from the customer's ProFile.

___ Remove and replace the LED assembly on the cover of the customer's ProFile, using the new LED front panel label.

___ Attach the two rear plates from the customer's ProFile onto the Exchange (spares kit) ProFile). Note that the serial number is on one of these plates.

___ Replace the customer's cover onto the Exchange ProFile fitting it into place over the two rear plates.

___ Place the used LED assembly along with the old front panel label in the assembly box.

___ Attach the cover marked "SHIPPING FIXTURE" onto the unit to be serviced.

___ Pack the unit to be repaired and the box containing the used LED assembly in the spares kit packaging.

___ Complete all shipping documentation.

Silentype

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SILENTYPE PRINTER TECHNICAL PROCEDURES

TABLE OF CONTENTS

Silentype Technical Procedures

Section 1

Take-apart

Contents:

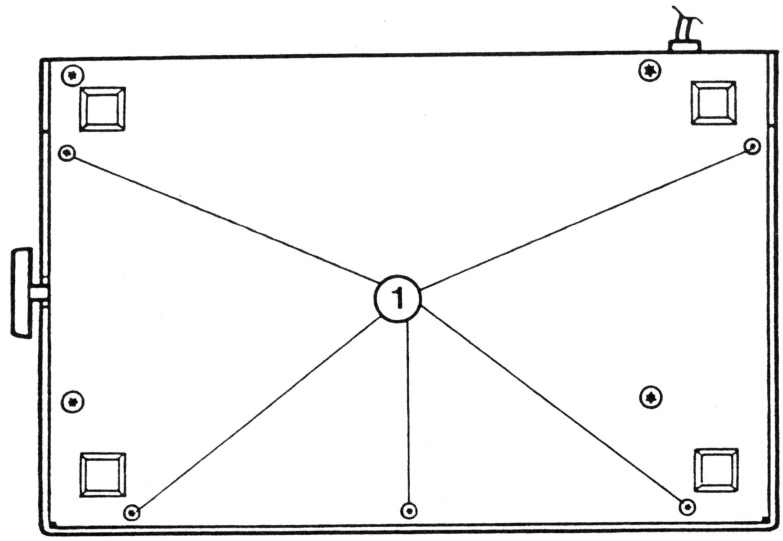


FIGURE 1

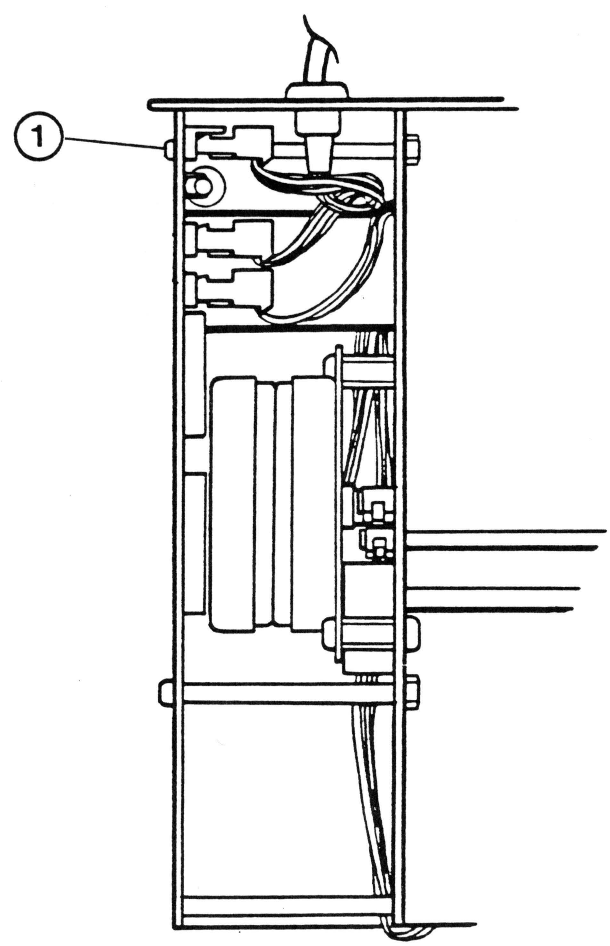


FIGURE 2

A. REMOVING THE COVER AND BASE

Removing the Cover

1. Turn the Apple off.

2. Disconnect the printer from the interface card.

3. Tip the unit up on its back.

   NOTE: Do not turn the Silentype completely over. The paper roll is held in by gravity.

4. Using a Torx screwdriver, remove the five screws around the outside of the base which hold the plastic cover on (see Figure 1).

5. Remove the cover.

Removing the Base

6. While holding the chassis to the base, remove the remaining four screws.

   NOTE: In general, it is a good idea to remove all nine screws every time you begin to service a Silentype, since you will nearly always have to get underneath the assembly.

7. Tip the unit back down. At the left of the unit is a printed circuit board (the deserializer card). Locate the three cables connected to it, and disconnect the rearmost cable (interface cable) from connector J3 (see Figure 2, #1). The chassis can now be lifted from the base.

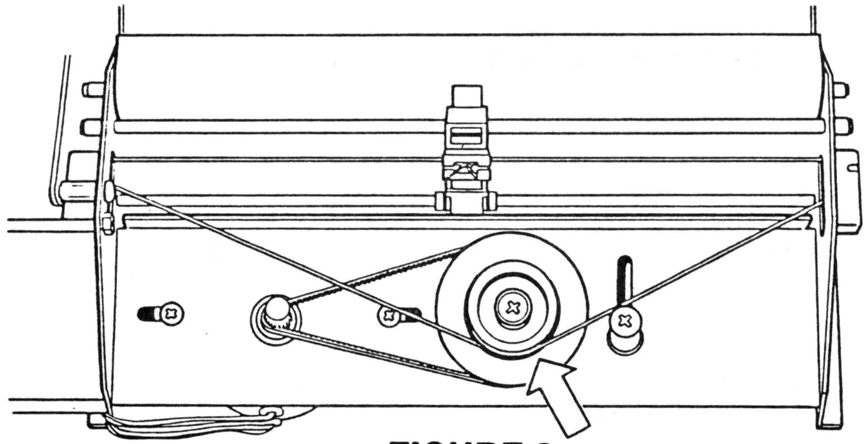


FIGURE 3

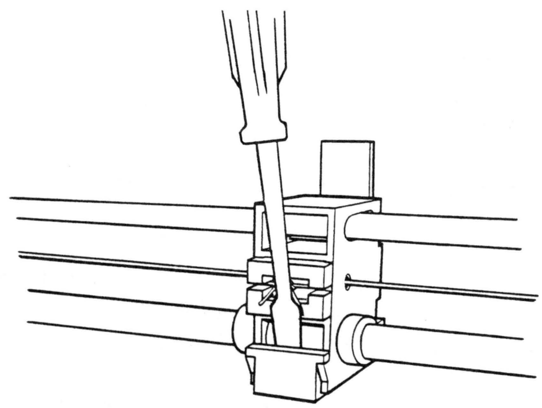


FIGURE 4

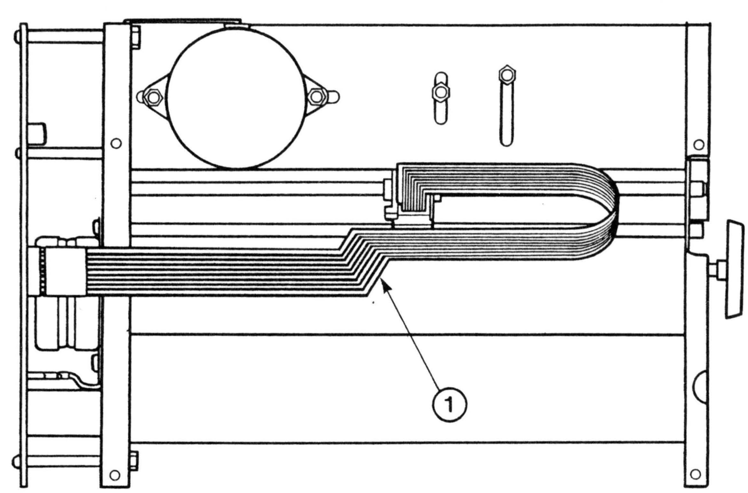


FIGURE 5

B. REPLACING THE HEAD CABLE

Removing the Cable

1. Remove the Silentype cover and base (see section A, p. 1.3).

2. Rotate the pulley (Figure 3) until the print head is in the center of the platen.

3. Using a small screwdriver, pry the cable clip away from the head carrier, forward and down (Figure 4). The cable will fall away from the head assembly.

4. Tip the chassis up so the underside faces you.

5. If the head cable is taped to the chassis, untape it.

6. Unplug the cable from the deserializer card.

7. Pull the cable clip off the other end of the cable. (Don't worry, it does come off.)

Installing the Cable

8. Hold the new cable up so the change of direction goes upward (Figure 5, #1), and carefully plug it to the deserializer card.

   IMPORTANT: THE HEAD CABLE IS EASILY DAMAGED. PERFORM THE NEXT STEPS CAREFULLY AND GENTLY. In particular, make sure the cable is fully inserted into the cable clip before connecting the clip to the print head assembly; otherwise you may crimp and crack it.

9. Plug the other end to the cable clip, making sure the small rubber pad is in place between the cable connections and the clip.

10. Bend the cable without twisting, and clip it to the print head assembly (Figure 5).

11. Make certain the cable crosses the left side of the chassis at a right angle, and secure it to the left rail with cellophane tape.

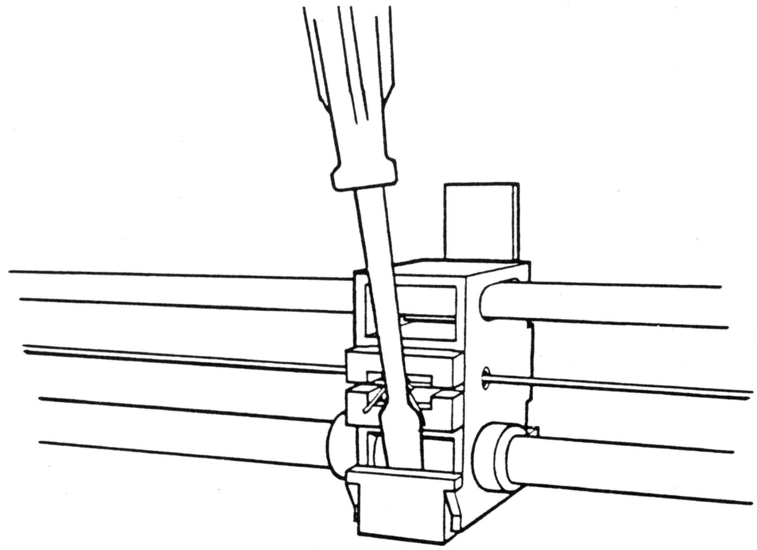


FIGURE 6

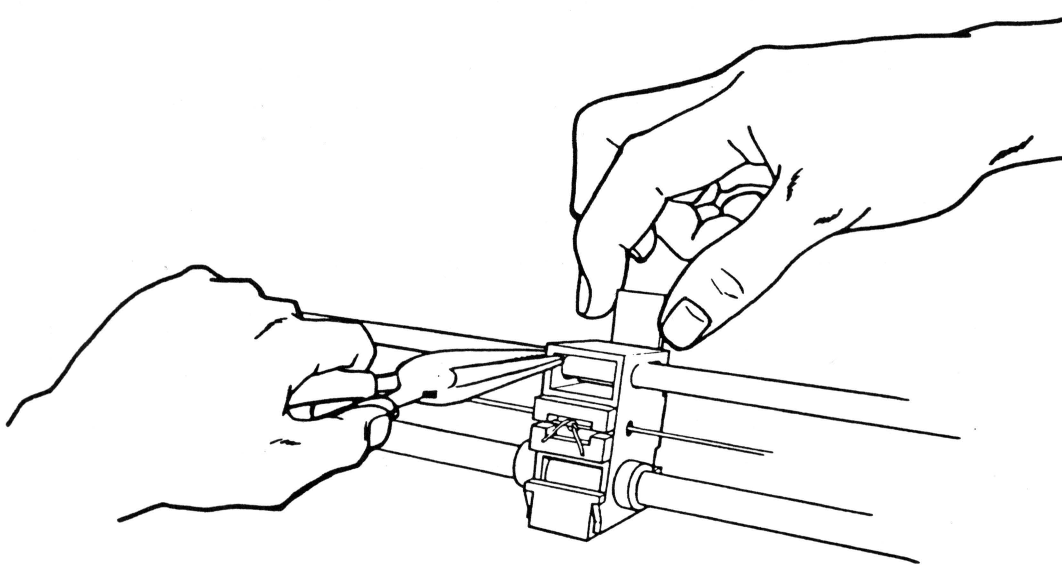


FIGURE 7

C. REPLACING THE PRINT HEAD

Removing the Print Head

1. Remove the Silentype cover and base (see section A, p. 1.3)

2. Pry the cable clip off the print head carrier, forward and down (Fig. 6). The cable will fall away from the head assembly.

3. Using needlenose pliers, gently pull the head carrier toward the front of the printer (see Figure 7).

   CAUTION: THE CERAMIC HEAD IS BRITTLE. THAT MEANS IT CAN SHATTER. IT ALSO CAN BE SHARP ENOUGH TO CUT FINGERS. USE CARE WITH THE NEXT OPERATION!

4. With your fingers, pull the head upward -- carefully -- sliding it out of the head carrier (see Figure 7). If you can't pull the head out with your fingers, stand the chassis on end and carefully push the head out of the carrier with a screwdriver.

INSTALLING THE PRINT HEAD

NOTE: The plastic bar that supports the paper is called the platen. It should not be necessary to remove it, but it sometimes falls out, and it is important to replace it SQUARE EDGE UP. Otherwise the print head will short out and ruin the Silentype.

5. Make sure the platen is properly seated and gently pushed back, then slide the new head in with the edge connector on the bottom and the white side facing you.

6. Push the head gently down until it is seated against the plastic stop. If it becomes caught, tilt the chassis up (to see what the problem is) and help it along. Be careful not to shear off the plastic stop at the bottom of the head carrier.

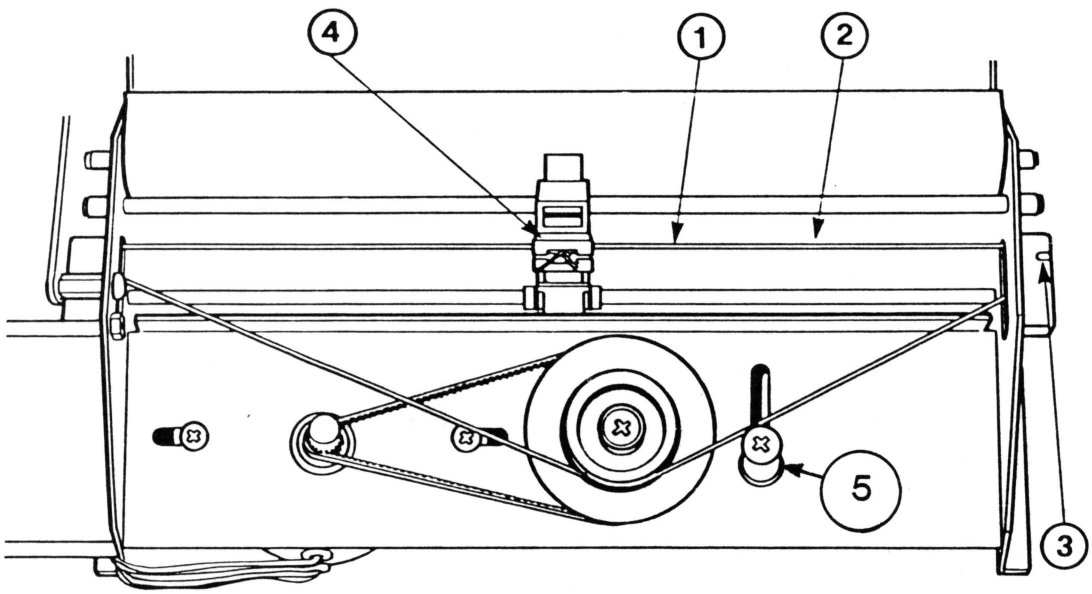


FIGURE 8

D. REPLACING THE DRIVE STRING

1. Remove the Silentype cover and base (see section A, p. 1.3).

2. Turn the pulley until the print head is in the middle of the platen.

3. Hold the pulley from beneath with a pair of pliers, and with a screwdriver, loosen the screw.

4. Push the pulley toward the printer, taking the tension off the string; then, with the pulley pushed toward the printer, tighten it back down.

   IMPORTANT: If the pulley is too close to the printer, it will bind. Make sure it can turn freely when you tighten it down.

5. Hold the idler (Figure 8, #5) from beneath with a pair of pliers, and with a screwdriver, loosen the screw and move the idler towards you. The idler screw can be left loose for right now.

6. Unwind the string from the pulley.

7. Cut the old string on the right side of the print head (Figure 8, #1).

8. Tie a new string (precut to approximately 40") to the right hand portion of the old string (Figure 8, #2).

9. Pull on the old string on the left side of the print head, until the new string is threaded through the right guide (Figure 8, #3), across the front, and through the left guide.

10. Cut the knot out completely.

11. Pry the retainer (Figure 8, #4) out of the head assembly, and discard the old string.

12. Thread the new string into the small holes from the outside of both sides of the head assembly, and tie a loose knot.

13. Pull the knot straight back until the string is taut.

14. Pull the front part of the string toward you about 14 inches; then take the portion of string coming out of the left guide and, starting at the bottom front of the pulley, wrap six turns counterclockwise around the pulley.

    IMPORTANT: Make sure the loops of string do not overlap; if they do, you will have alignment problems.

15. Grasp the knot and pull until the string is snug.

16. Slip the retainer in place in the print head assembly.

17. Holding the string snug, cut out the old square knot and start a new one.

    NOTE: Make sure the string runs **between** the idler and the paper.

18. Tighten it, finish the square knot, and cut away the excess string.

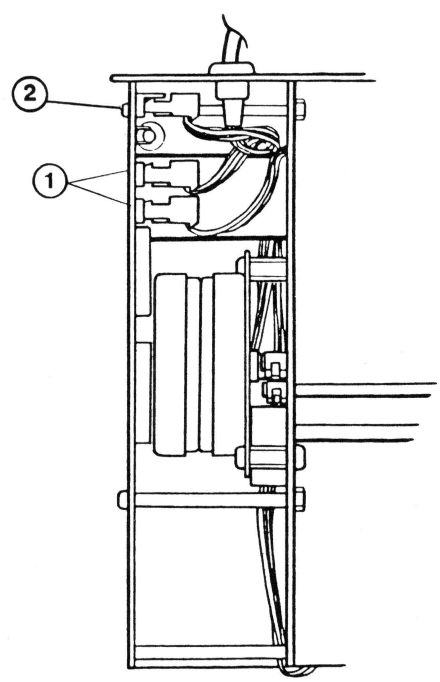


FIGURE 9

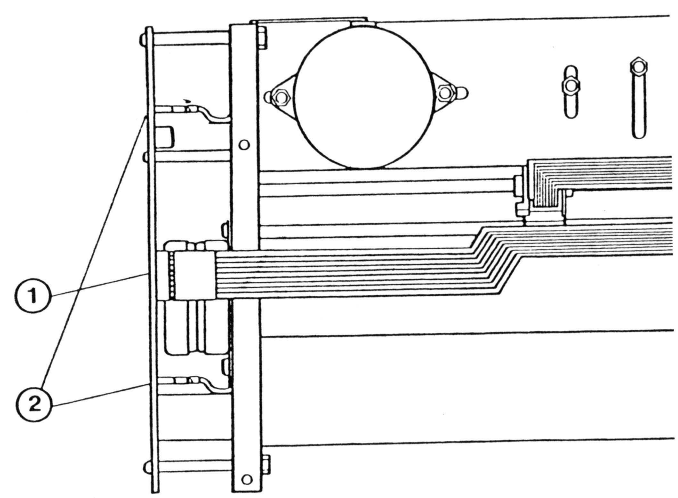


FIGURE 10

E. REPLACING THE DESERIALIZER CARD

Removing the Card

1. Remove the Silentype cover and base (see section A).

2. Locate the two motor plugs (Figure 9, #1). Put a piece of tape on the frontmost plug, to identify it.

3. Remove the two motor plugs.

4. Turn the chassis up and disconnect the print head cable (Figure 10, #1).

5. Disconnect the left margin switch connector (Figure 10, #2).

   NOTE: On the EMI version of Silentype, the left margin switch consists of two wires, as shown in Figure 10. Earlier Silentypes have only one wire (the rear one).

6. Remove the three screws holding the deserializer card to the chassis.

   IMPORTANT: BEFORE REPLACING THE DESERIALIZER CARD, MAKE SURE THAT THE NEW CARD IS EMI-COMPATIBLE WITH THE CHASSIS. SEE SECTION 5, SILENTYPE MODIFICATIONS.

Installing the Card

7. Put the card into position, taking care not to capture any wires behind the capacitor, and thread the bottom screw through the spacer and nut until it is "finger-tight".

8. Put in the other two screws. After checking to make sure no wires are caught beneath the spacers, tighten the three screws.

9. If you're working on a non-EMI Silentype, make sure that the bottom screw is tight enough to make good electrical contact. (It is part of the electrical continuity that forms the ground.)

10. Connect the left margin switch wire(s) and the print head cable.

11. Tip the chassis back down. Plug in the motor plugs (on each, the orange wire connects to the top pin) and the interface cable (Figure 9, #1 and 2). Remove the tape from the frontmost plug.

12. Reinstall the base and cover. Make sure all screws are tight.

    NOTE: Do not apply power while the printer assembly is loose in the base; it may cause a short circuit between the base and the deserializer card.

Silentype Technical Procedures

Section 2

Alignment Procedures

Contents:

A. Silentype Alignment Procedures

Whenever you change the string on a Silentype, or when a customer complains that the print margins are misaligned, perform the following procedures.

1. Using a known-good Apple][system, make sure the power is off, then plug the Silentype interface card into Slot 1 on the motherboard. Make sure the card is properly seated, and then turn the power on.

2. Place the Apple][Product Diagnostics diskette (P/N 652-0334) in drive 1. Boot the diagnostic and select CARD TESTS from the main menu; then select SILENTYPE TEST from the secondary menu.

3. Accept "Align print head" when that option comes up on the screen. The program will cause the Silentype to print rows of capital H's until you stop it by pressing Y. The rows of H's will allow you to see if there is any misalignment. If there is serious misalignment (more than one dot to the left or right), continue with these procedures.

4. **Check the drive string where it winds around the pulley.** If the loops of string are uneven, overlapping each other, the string tension will be uneven and that will cause misalignment. If necessary, loosen the pulley and re-wrap the string around it so that the loops of string do not overlap.

5. **Check the tension on the drive string.** It should be just tight enough so that it does not slip on the pulley. To adjust it coarsely, loosen the pulley screw and move the pulley to the desired position; then tighten the screw.

6. **Check the tension on the motor belt** (between the motor and the pulley): it should be just tight enough to prevent slipping. Overtightening causes the print head to move unevenly, which makes alignment difficult. (It also causes wear on the bearings.) If necessary, loosen the two motor mounting screws very slightly (the adjustment is easiest if they are slightly tight) and move the motor. Start with a snug but not stretched belt. Print a pair of lines and notice any misalignment. Move the motor slightly to the right and observe the printing of a pair of lines. Repeat until alignment is as good as you can make it; then tighten the motor screws.

7. While the "H's" are printing, **change the position of the idler roller** by loosening the idler screw and moving the idler. This fine-tunes the tension on the string. When alignment is as good as you can make it, tighten the idler screw.

Silentype Technical Procedures

Section 3

Diagnostics

Contents:

INTRODUCTION

This diagnostic is found on the Apple][Products Diagnostics diskette (Part Number 686-0005) under the main menu selection of CARD TESTS.

A. ALIGNING THE SILENTYPE PRINTER MECHANISM

1. This test would be run whenever the print quality of the Silentype is poor or the print head does not move smoothly from one margin to the other.

2. To run the test:

   a. Install the Silentype Interface card in slot 1 and connect the Silentype to it.

   b. Boot the Apple][Product Diagnostics diskette.

   c. Use the <ESC> key to move the cursor to the CARD TESTS line on the main menu, then press <RETURN>.

   d. Use the <ESC> key to move the cursor to the SILENTYPE TEST line on the card test menu, then press <RETURN>.

   e. Type in "Y" and then press <RETURN> to the prompt:

      DO YOU WISH TO ALIGN THE PRINT HEAD
      DRIVE MECHANICS AT THIS TIME?

   f. The Silentype will start to printing H's from the left to right margin then reverse direction and print H's from the right to the left margin.

      (1) You can suspend the printing at any time by pressing "Y" to the prompt:

         DO YOU WISH TO SUSPEND PRINTING?

      (2) You can then exit the test by pressing "N" to the prompt:

         DO YOU WISH TO RESUME PRINTING PATTERN?

         (a) If you answer yes by pressing "Y", the test will resume printing H's.

   g. Observe the quality of the printed characters on the paper for:

      (1) Bidirectional Printing

         (a) If the left and right margins are not even, adjust the Dacron Cord.

(2) That the Print Head moves evenly from one margin to the other.

(a) If the Print Head movement is uneven, adjust the Drive Motor belt tension.

(3) For all other print quality problems, refer to the Silentype Troubleshooting - Section 4.

B. OTHER TESTS

1. The Remaining tests on the Apple][Product Diagnostics are for testing the carriage and paper drives, printing and variable intensity circuits, and bi-directional print function.

2. To run the tests:

   a. Install the Silentype Interface card in slot 1 and connect the Silentype to it.

   b. Boot the Apple][Product Diagnostics diskette.

   c. Use the <ESC> key to move the cursor to the CARD TESTS line on the main menu, then press <RETURN>.

   d. Use the <ESC> key to move the cursor to the SILENTYPE TEST line on the card test menu, then press <RETURN>.

   e. Type in "N" and then press <RETURN> to the prompt:

   DO YOU WISH TO ALIGN THE PRINT HEAD
   DRIVE MECHANICS AT THIS TIME?

3. Firmware Test

   The Firmware test will check the ROMS on the Silentype Interface Card and report their condition to you.

4. RAM Test

   The Ram test will check the RAM on the Silentype Interface Card and report their condition to you.

5. Margin Switch

   This test will check the status of the left margin switch and report to you it's condition.

6. Head Movement

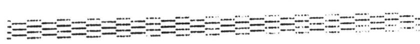
   This test will make the print head move back and forth. Observe that the Print Head moves smoothly in both direction.

7. Line Feed

   This test will send a line feed character to the Silentype. Observe that the paper exits squarely and that there are no wrinkles or creases caused by the paper feed mechanism.

8. Print Head Dot Integrity

   This test will print a series of lines on the printer paper, each one representing one of the seven dots on the Print Head. Below is an example from a good Silentype Printer:



9. Print Intensity Control Test

   This test prints out 6 lines on the printer paper which vary in eight degrees of intensity. Below is an example from a good Silentype Printer:



10. Bidirectional Print Registration

   This test prints parallel vertical lines to verify the Bidirectional Print Adjustment. The tolerance is +/- one dot.

```
 * *          * *          * *
 * *          * *          * *
 * *          * *          * *

 * *         * *         * *
 * *         * *         * *
 * *         * *         * *
Perfect      Good     Unacceptable
```

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Silentype Technical Procedures

Section 4

Troubleshooting

Contents:

Silentype Troubleshooting Chart

Symptom	Probable Cause
Some dots are not printing.	1) Head Cable 2) Print Head 3) Deserializer Card
One or more dots print continuously.	1) Deserializer Card
Silentype prints wrong characters.	1) Deserializer Card
No print head movement or movement is erratic.	1) Belt Tension adjustment
Print intensity test failure from Apple][products diagnostics.	1) Deserializer Card
Bidirectional print test failure from Apple][products diagnostics.	1) Cord tension Adjust- ment.
Silentype prints unreadable or no characters; Print Head moves.	1) Print Head 2) Platen Assembly 3) Deserializer Card
Paper does not advance properly.	1) Paper Bearing Assembly 2) Deserializer Card 3) Paper drive motor

NOTE: If the symptom is not repaired by the above list, send the silentype unit back to an Apple][Level II Service Center for repair.

apple computer inc.

Silentype Technical Procedures

Section 5

Modifications

Contents:

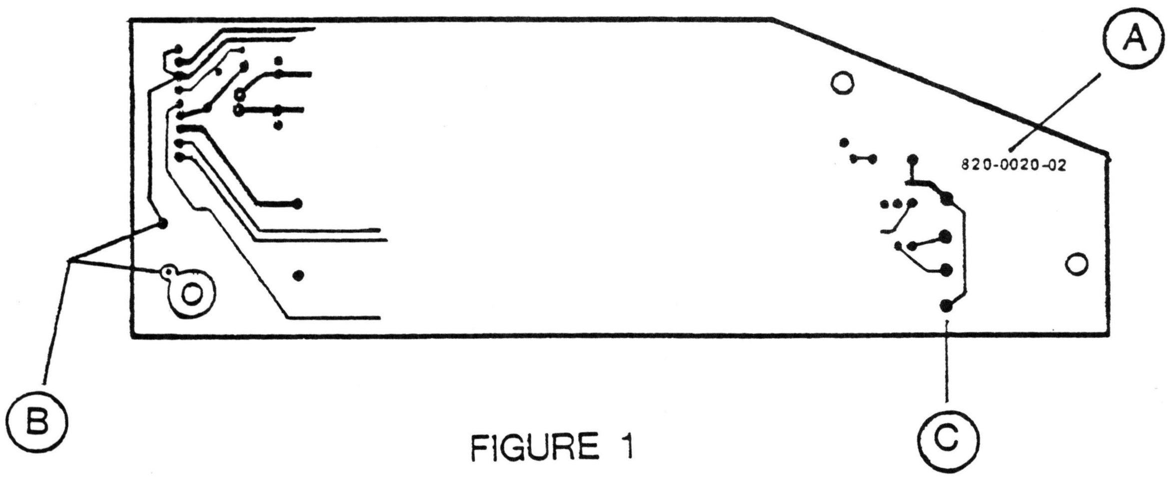


FIGURE 1

A. EMI MODIFICATIONS TO THE SILENTYPE

Like the Apple II, the Silentype has been modified to reduce the electromagnetic (radio frequency) interference produced by early models. The new versions are called EMI (or RFI) Silentypes.

Only the EMI chassis and deserializer card are now produced and available from Apple, but there are plenty of early-model Silentypes in the field. If you have to swap out the deserializer card on an old, non-EMI Silentype, you will have to replace it with an EMI card; but unless you modify it, the new card will cause the old chassis to print with an uneven left margin. Therefore you need to know how to identify the two types of chassis and deserializer card, and how to modify the EMI card to work with a non-EMI chassis.

1. IDENTIFICATION

The Chassis

The EMI Silentype chassis has a two-wire left margin switch connector where the earlier Silentype has a single-wire connector. They are also distinguishable by model number: the earlier version has model number A2M0032, the EMI version has model number A2M0036. The model number is printed on the label on the back of the case.

To summarize:

Non-EMI	EMI
Model # A2M0032	Model # A2M0036
One-wire left margin switch	Two-wire left margin switch

The Deserializer Card

The EMI card has part number 820-0020-02 printed on the trace side (see Figure 1, A). It has an additional terminal pin (J6) (Figure 1, C) for the extra EMI left margin wire switch.

The non-EMI card bears part number 820-0020-01. It has a single terminal pin (labelled J5) for the left margin switch wire.

More information on the differences between the EMI and non-EMI versions of Silentype can be found in Apple Service Bulletin #39.

TURN PAGE

2. MODIFYING THE EMI CARD

To modify the EMI card for use with a non-EMI chassis, you must solder a jumper wire across two solder pads provided on the card for that purpose (see Figure 1, B). Follow the procedure below:

1. Find the two solder pads on the deserializer card (Figure 1, B). If the holes are filled with solder, open them using a soldering iron and solder sucker.

2. Take a one-inch piece of 20- to 24-gauge insulated wire. Remove approximately 1/4 inch of insulation from each end of the wire.

3. Insert one end of the jumper through the hole in one of the solder pads (from the trace side of the board). Solder it into place. Do the same for the other end and the other solder pad.

4. Snip off any excess jumper wire that may protrude on the other side of the card.

5. Install the deserializer card in the printer as usual. Note that the left margin switch wire from the chassis should connect to post J5 on the card and that J6 (Figure 1, C) will not be used.

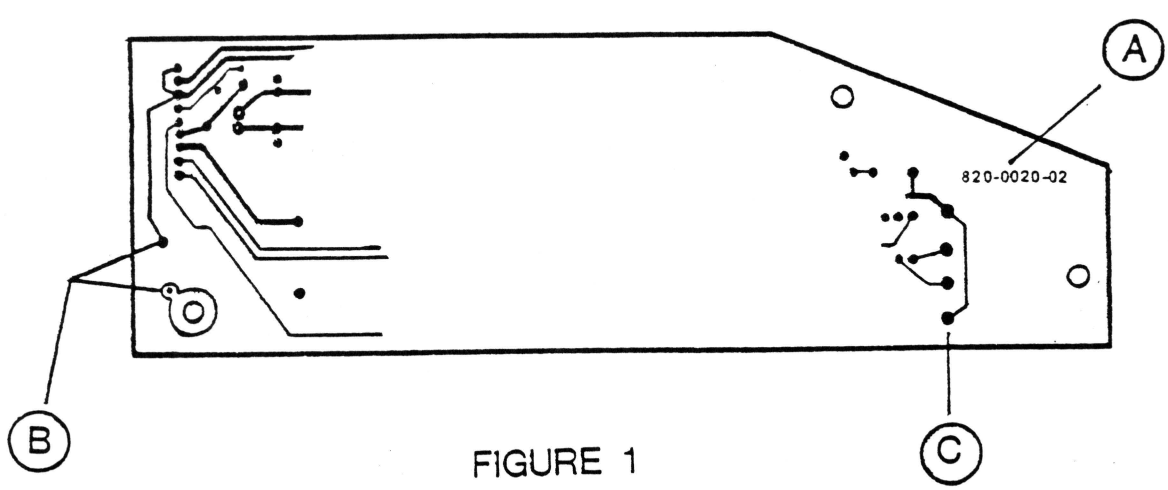


FIGURE 1

Dot Matrix
Printer

apple computer inc.

DOT MATRIX PRINTER TECHNICAL PROCEDURES

TABLE OF CONTENTS

apple computer inc.

Dot Matrix Printer Technical Procedures

Section 1

Introduction

Contents:

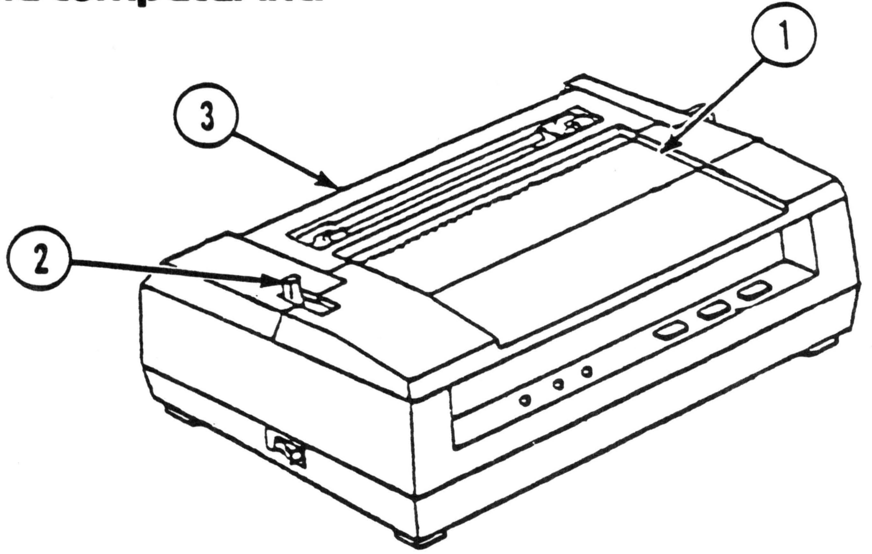


FIGURE 1

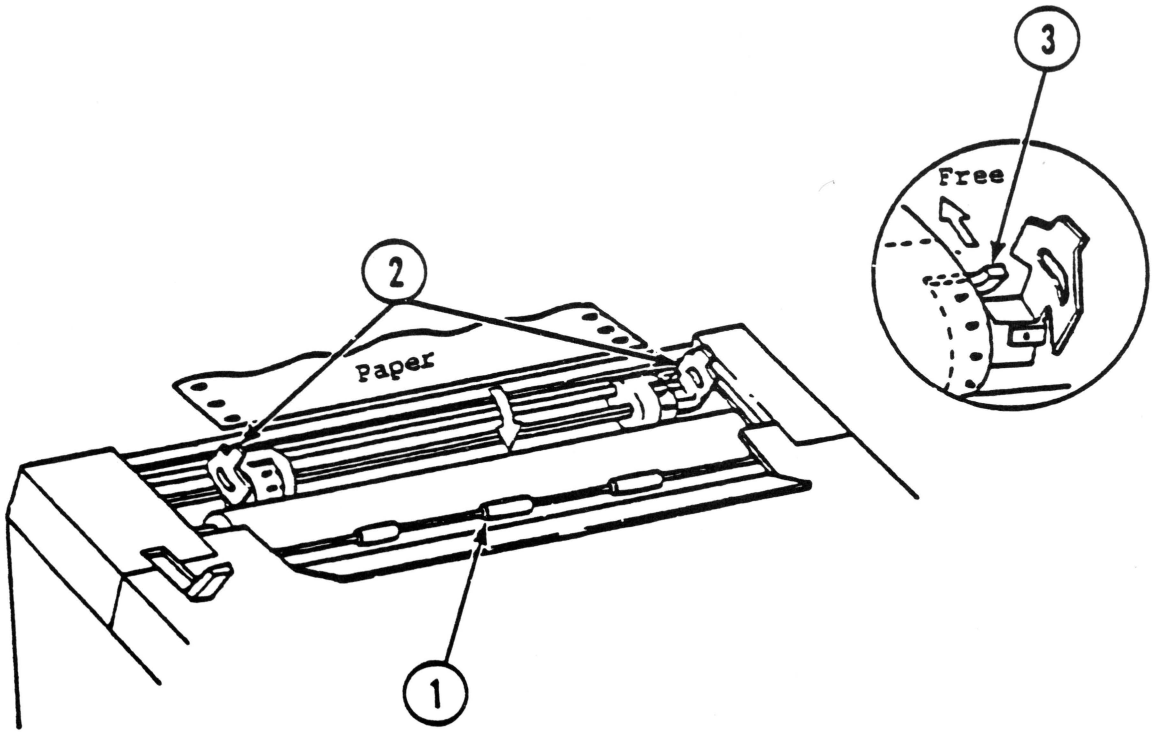


FIGURE 2

A. POWER ON AND OFF, LOAD AND REMOVE PAPER AND RIBBON CASSETTE, AND RUN SELF-TEST

Power on and off

1. Plug the power cable into the back of the printer.
2. Plug the power cable into an electrical outlet.
3. Flip the power switch to ON.
4. Check the front panel. Make sure the POWER light comes on.
5. Flip the power switch to OFF.

Load paper

1. Make sure the power is off.
2. Raise the paper cutter toward you. (See Figure 1, #1.)
3. Pull the paper release level forward. (See Figure 1, #2.)
4. Remove the paper cover. (See Figure 1, #3.)
5. Pull the paper roller shaft forward. (See Figure 2, #1.)
6. Lift the covers off the right and left tractor sprockets. (See Figure 2, #2.)
7. Make sure the left tractor is all the way over to the left. To adjust the tractor, push back the white lever. (See Figure 2, #3.) Move the tractor all the way over to the left. To lock the tractor in place, pull the white lever back toward you.

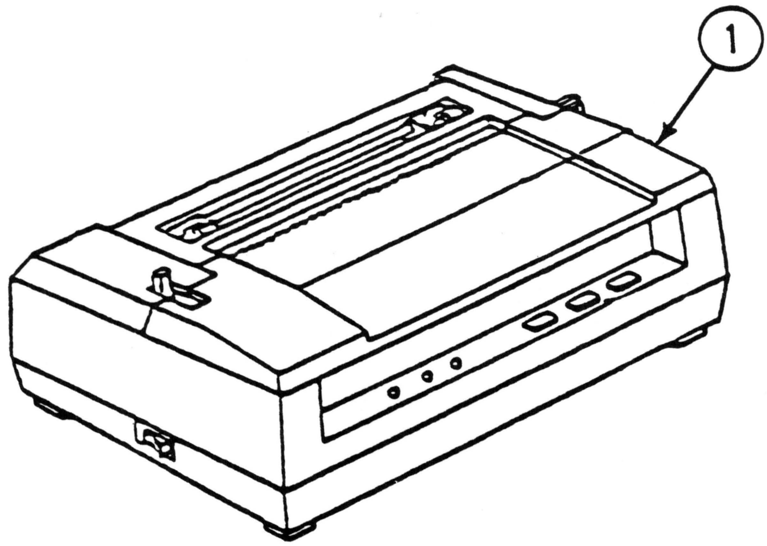


FIGURE 3

8. Insert the paper over sprockets. If the paper doesn't line up with the sprockets, adjust the right tractor until it does.

9. Push down the covers on right and left tractor sprockets.

10. Turn the platen knob until the paper comes through.

11. Push back the roller shaft.

12. Push back the release lever.

13. Put the paper cover back on.

14. Push back the paper cutter.

Remove Paper

1. Make sure the power is off.

2. Pull the paper cutter toward you.

3. Remove the paper cover.

4. Pull the release lever forward.

5. Turn the platen knob to back out the paper.

Remove Ribbon Cassette

1. Make sure power is off.

2. Remove the carrier cover. (See Figure 3, #1.)

3. While pushing down on the cassette latch arms, lift up the cassette.

4. Replace the carrier cover.

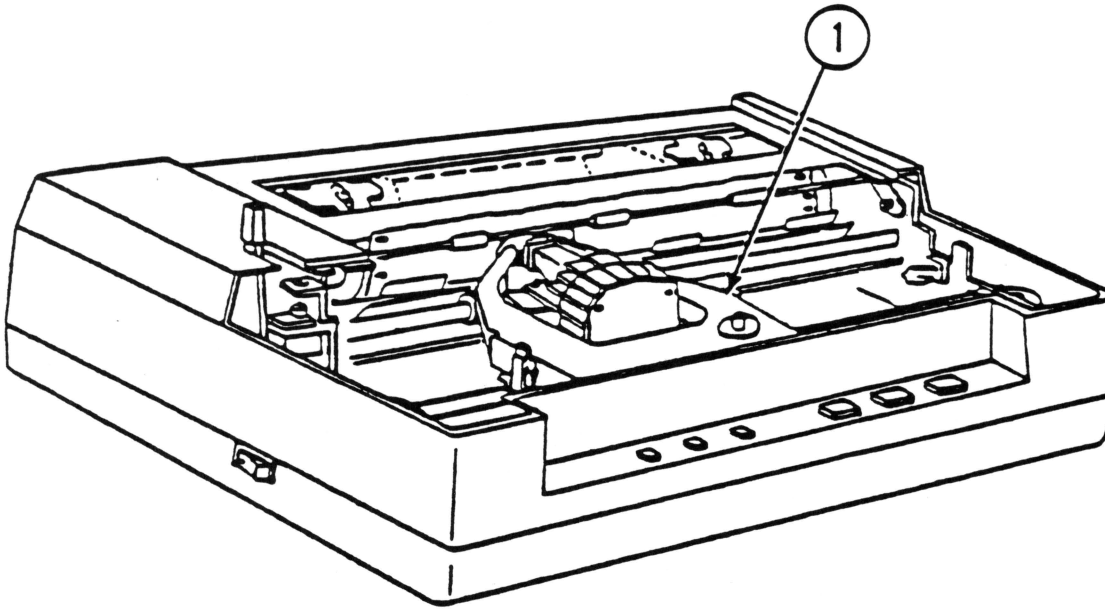


FIGURE 4

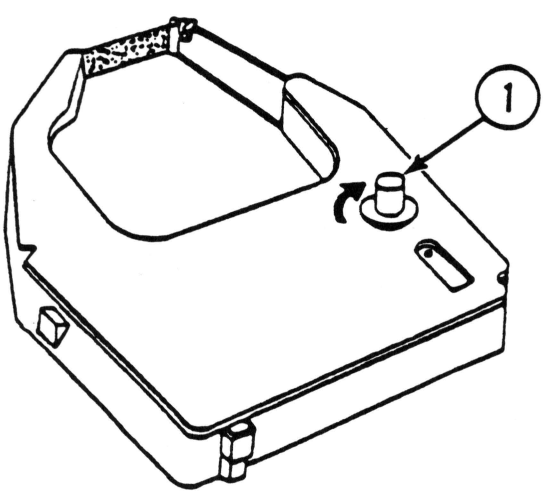


FIGURE 5

Load Ribbon Cassette

1. Make sure the power is off.

2. Remove the carrier cover.

3. Get a ribbon cassette.

4. Put the cassette on the ribbon support plate.

5. Push down on the cassette until it snaps in place. (See Figure 4, #1.)

6. On the cassette, turn the knob as shown until you hear it "click" and the ribbon is taut. (See Figure 5, #1.)

7. Replace the carrier cover.

Run Self-test

NOTE: When you run the self-test, you should always use a brand new ribbon and a single sheet of paper. Before you begin the test, push up the red head adjusting lever on the right side of the printer.

1. Make sure the power is off.

2. Load the paper. Make sure the paper is secure under the roller shaft.

3. To run self-test, press and hold the T.O.F. switch on the front panel, then switch the power on. The printer will then start printing out lines of characters. Each line contains the letters of the alphabet, the numbers 0 through 9, and a series of typographical characters.

4. To end the test, set the power switch to OFF.

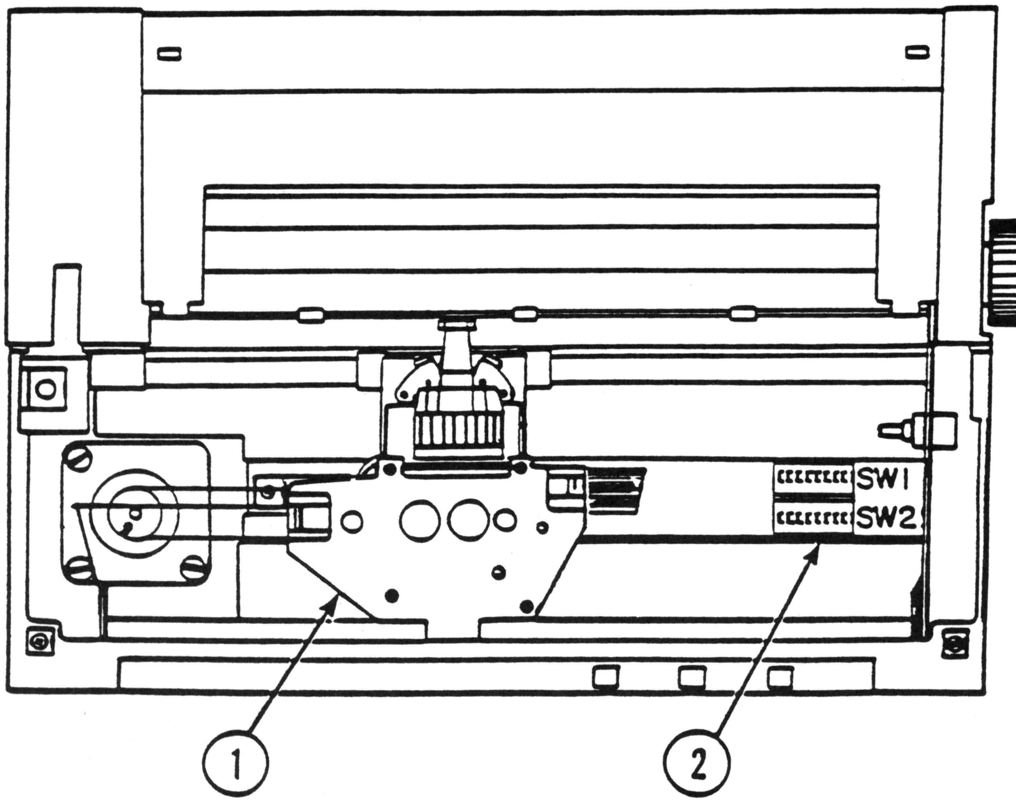


FIGURE 6

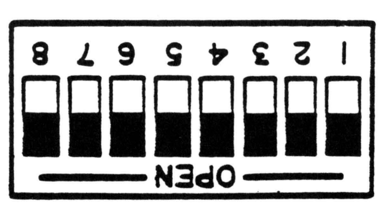


FIGURE 7

B. SET CONFIGURATION SWITCHES

For this procedure you will need:

A tiny flat blade screwdriver

1. Make sure the power is off.
2. Remove the paper and the carrier cover.
3. Slide the carrier all the way to the left. (See Figure 6, #1.)
4. Locate switches SW 1 and SW 2. (See Figure 6, #2.)
5. Pull the plastic strip out of the way.
6. Using a small screwdriver, set all the SW 1 switches to OPEN. (See Figure 7.)
7. Using the chart on the next page, set all SW 1 switches to their normal setting.

		SW 1 SWITCH SETTINGS
SWITCH	NORMAL SETTING	PURPOSE
1 2 3	OPEN CLOSED OPEN	Switches 1-3 select which set of national characters will be printed. If you set the switches to OPEN, CLOSED, OPEN, the printer will print United States characters.
4	OPEN	Switch 4 selects paper length. Set the switch to OPEN for paper that is 11 inches long. (66 lines)
5	OPEN	Switch 5 determines if a host computer can put the printer on-line and off-line. If you set the switch to OPEN, the host computer will have this capability.
6	OPEN	The computer sends characters to the printer. Sometimes the printer stores these characters without receiving a command to print them. When the printer's memory is full, it can do one of two things when it receives a print command. 1) It can go to a new line on the page and begin printing. 2) It can print from wherever the print head is at the time the print command is received. Normally, you want the printer to start where it left off, so set switch 6 to OPEN.
7	CLOSED	The computer tells the printer to start printing by sending a print command. There are a number of print commands. They include Carriage Return, Linefeed, Vertical Tab, and Formfeed characters. Normally, you want any of these characters to start printing. So set Switch 7 to CLOSED. If Switch 7 is set to OPEN, only a Carriage Return character will start printing.
8	OPEN	If the host computer sends a Linefeed following the Carriage Return, set switch to OPEN. If host does not send the Linefeed, the printer will add a Linefeed when switch is CLOSED.

8. When you finish setting the switches, make sure SW 1 looks like this:

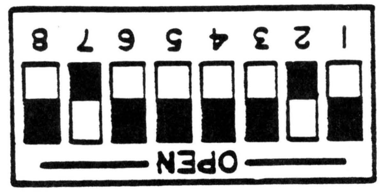


FIGURE 8

9. Using a small screwdriver, set all SW 2 switches to OPEN.

10. Using the chart on the next page, set all SW 2 switches to their normal setting.

		SW 2 SWITCH SETTINGS
SWITCH	NORMAL SETTING	PURPOSE
1	CLOSED	The number zero can be printed with a slash through it. This way the user won't confuse it with the letter O. Set the switch to CLOSED to print slashed zeroes.
2	OPEN	This switch determines the size of the printer's memory. To get the largest memory possible, set this switch to OPEN. CLOSED is only 1 line buffer.
3 4	Not Used Not Used	The printer doesn't use these switches. It doesn't matter if they are OPEN or CLOSED.
5	CLOSED	Set to OPEN for 10 characters per each inch regardless of the size of each character. Set to CLOSED to have the printer adjust spacing for character size. Other print modes are software selectable.
6	CLOSED/ OPEN	This switch tells the printer to expect either a 7-bit or 8-bit data from the computer. If you're using an interface that uses 7-bit data, set it to CLOSED. If you're using an 8-bit interface, set it to OPEN.
7	CLOSED	If this switch is set to CLOSED, the printer will be automatically on-line (SEL LIGHT) whenever it is turned on. If you want the printer to be off-line, (NOT SEL) however, set it to OPEN.
8	OPEN	If this switch is set to OPEN, the printer will be able to print in both directions. If you set it to CLOSED, the printer will only be able to print from left to right.

11. When you finish setting the switches, make sure SW 2 looks like this:

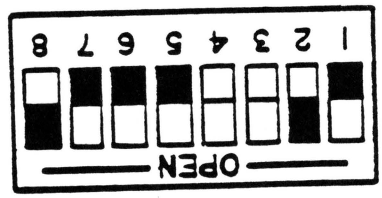


FIGURE 9

12. Push the plastic strip back over the switches.

13. Replace the carrier cover.

14. Run the self test.

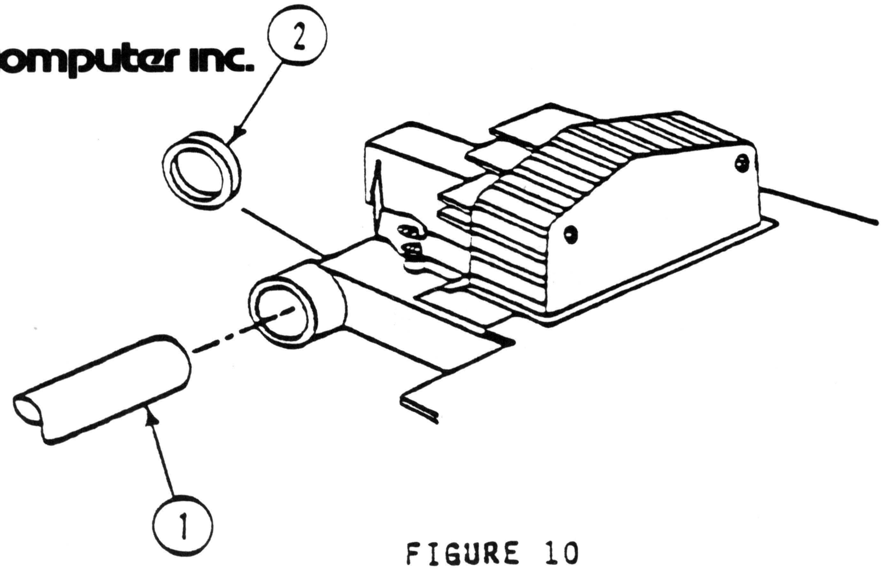


FIGURE 10

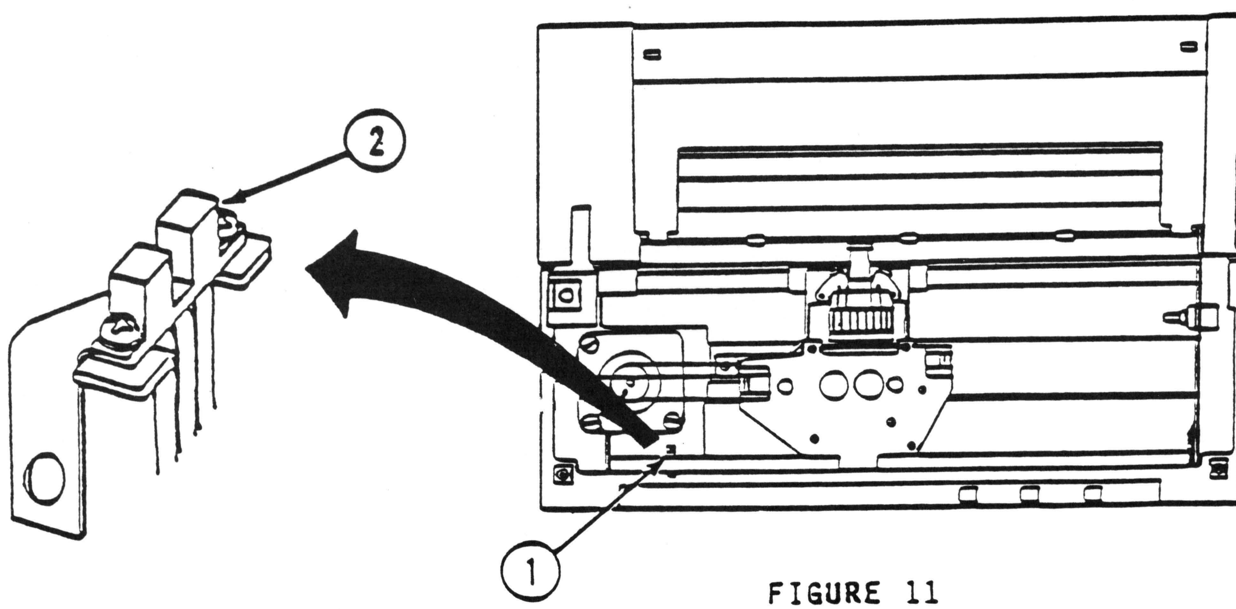


FIGURE 11

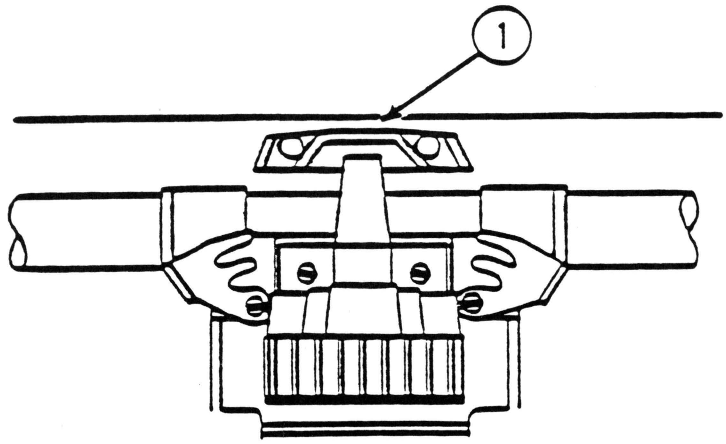


FIGURE 12

C. PERIODIC MAINTENANCE

You should clean the printer as required. You should lubricate the printer only once a year.

1. Make sure the power is off.

2. Remove the paper cover and the carrier cover.

3. Remove the paper and ribbon cassette.

4. On the carrier shaft, wipe off any dirt with dry gauze or absorbent cotton. (See Figure 10, #1.)

5. On the lubrication ring, apply a small amount of lubrication oil. (See Figure 10, #2.)

6. Find the detector plate. It is on the left front side of the printer, hidden just below the guide rail. (See Figure 11, #1.)

7. Using a brush, remove any paper dust. (See Figure 11, #2.)

8. On the head top, brush off any ribbon chips and paper dust. (See Figure 12, #1.) WARNING: Do not use alcohol to clean the dot head. **Alcohol will destroy the dot head.**

9. Replace the ribbon cassette.

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Dot Matrix Printer Technical Procedures

Section 2

Take-apart

Contents:

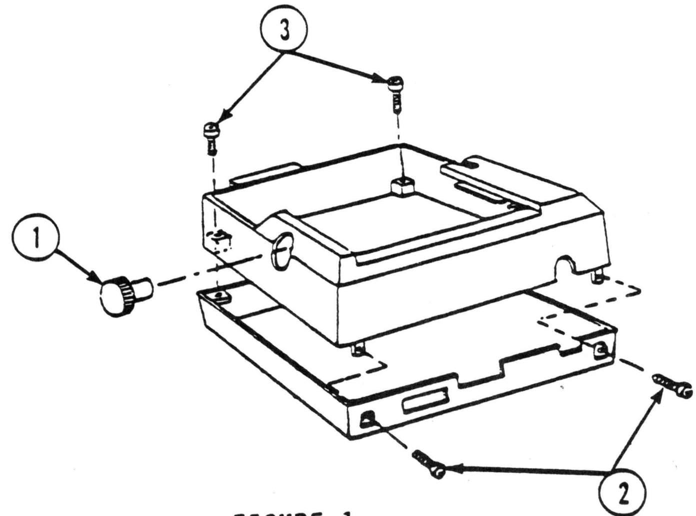


FIGURE 1

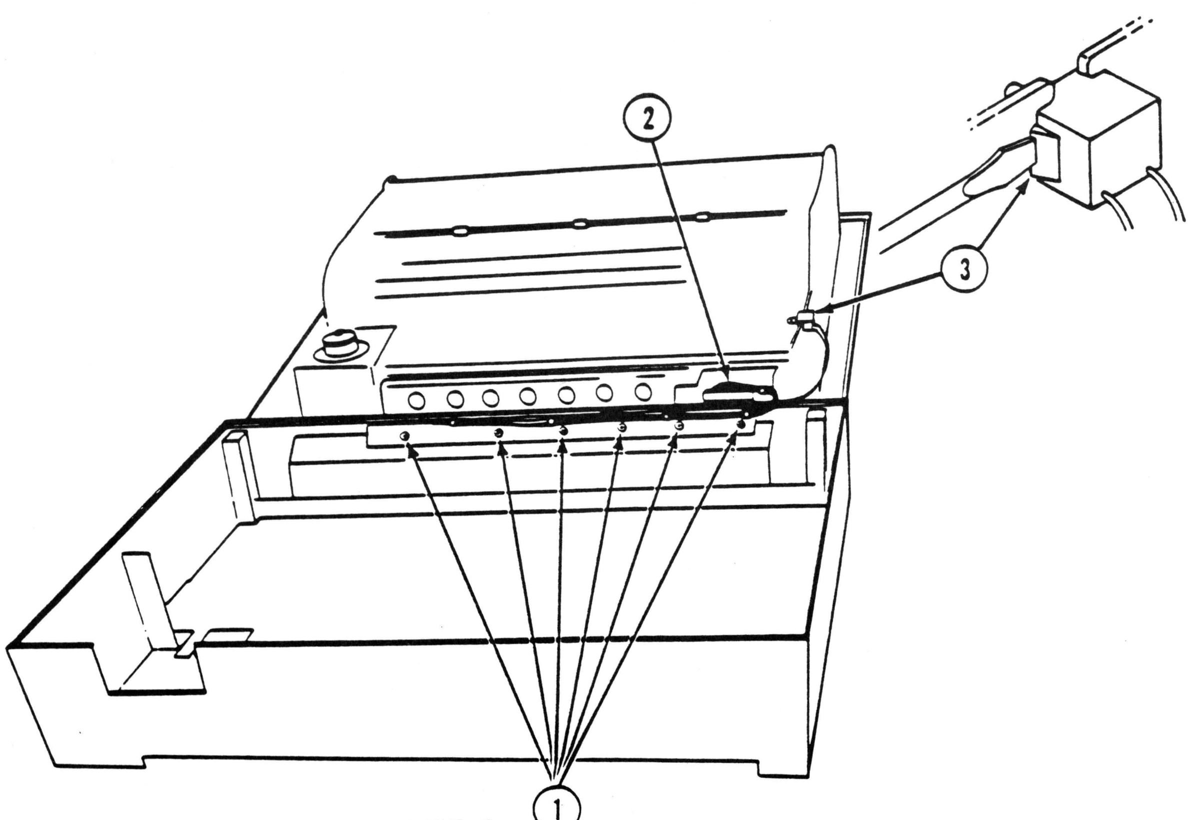


FIGURE 2

A. REMOVE AND REPLACE THE SWITCH PANEL

For these procedures you will need:

Two Phillips screwdrivers (#1, #2)
Small flat blade screwdriver

Remove:

1. Remove the power cord from printer.

2. Remove the carrier cover.

3. Pull off the platen knob. (See Figure 1, #1.) If it doesn't come off easily, place the blade of a flat blade screwdriver in the slot of the shaft of the platen knob (i.e., where the knob attaches to the platen). Twist the screwdriver, thereby widening the knob so you can pull it off.

4. To remove the top cover, remove the two screws at the rear of printer. (See Figure 1, #2.)

5. Remove the two screws at the front of printer. (See Figure 1, #3.)

6. Lift the top cover up. Place it face down on the table.

7. Remove the six screws from the back of the switch panel. (See Figure 2, #1.)

8. Pull the switch panel connector from the CPU board. The connector is in the "well" at the right front of the printer. Reach down into the "well" to find it. If you have trouble getting the connector free, carefully use a flat bladed screwdriver to pry it loose. (See Figure 2, #2.)

9. Using a flat blade screwdriver, depress the latches on both sides of the limit switch and push the switch in toward the center of the printer. (See Figure 2, #3.) Lift the wire free from the slot.

10. Pull the switch panel free.

Replace:

1. Put the switch wire back into the slot. Push the limit switch back until it clamps in place. It should be snug with side frame.
2. Attach the switch panel connector to the CPU board.
3. Replace the six screws in the back of the switch panel.
4. Pull the top cover back over the printer.
5. Replace the carrier cover and the platen knob.
6. Plug the printer back in.
7. Power on. Check that power lamp lights.

CONTINUED ON NEXT PAGE

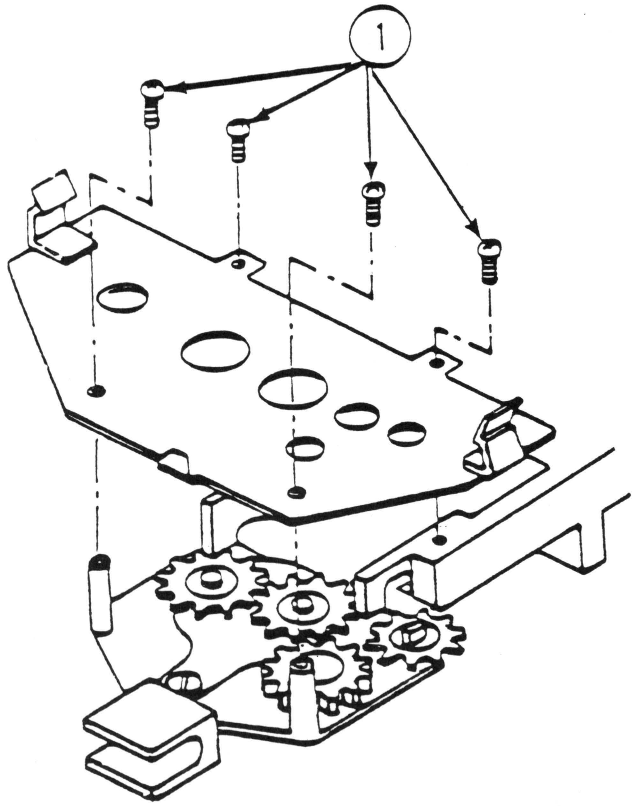


FIGURE 3

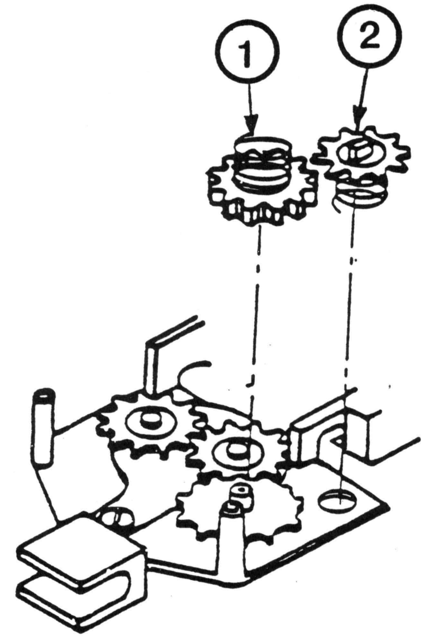


FIGURE 4

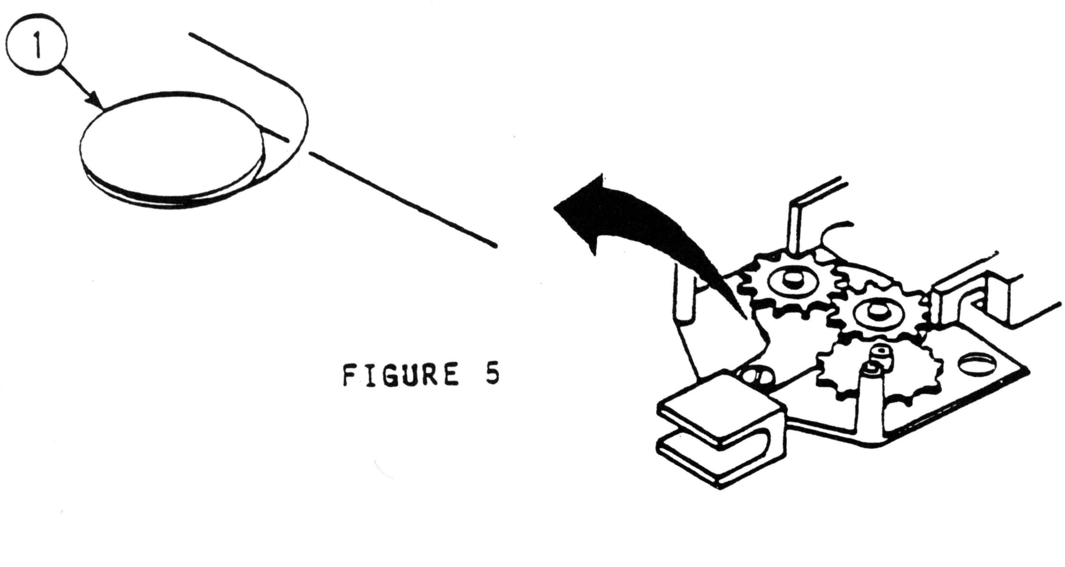


FIGURE 5

B. REMOVE AND REPLACE THE RIBBON WIRE

For these procedures you will need:

Small Phillips screwdriver

Remove:

1. Remove the power cord.

2. Lift off the carrier cover and pull off the platen knob (Section 2A, page 2.3).

3. Lift off the top cover. Set it face down.

4. For easier access to the ribbon wire, disconnect the top cover from the printer. To do this, pull the switch panel connector from CPU board. Push the limit switch in toward center of board and lift the wire free. Remove the top cover and set it out of the way.

5. Remove the ribbon cassette (Section 1A, page 1.5).

6. Remove the four cassete mount plate fixing screws. (See Figure 3, #1.)

7. Slowly lift off the cassette mount plate.

   NOTE: There are springs beneath the cassette mount plate (See Figure 4). They may pop out when you lift up the mount plate.

8. Pull up the ratchet gear and ratchet spring. (See Figure 4, #1.) If they don't come off easily, carefully pry them off with a flat blade screwdriver.

9. Pull off the cassette drive gear and the ribbon spring. (See Figure 4, #2.)

10. Notice how the ribbon wire is wrapped around the ribbon pulley gear. (See Figure 5, #1.) Also, notice how the ribbon wire goes through the carrier assembly. This will help you when you have to replace the ribbon wire.

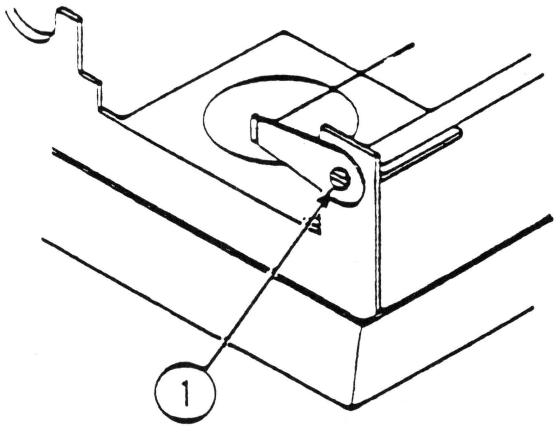


FIGURE 6

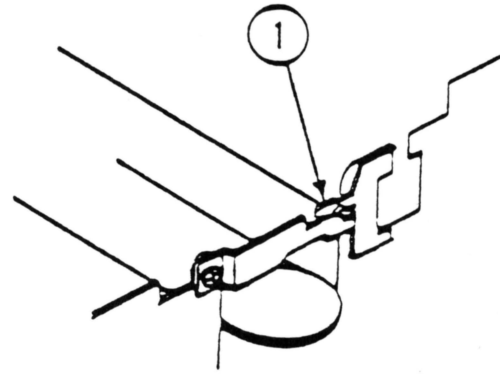


FIGURE 7

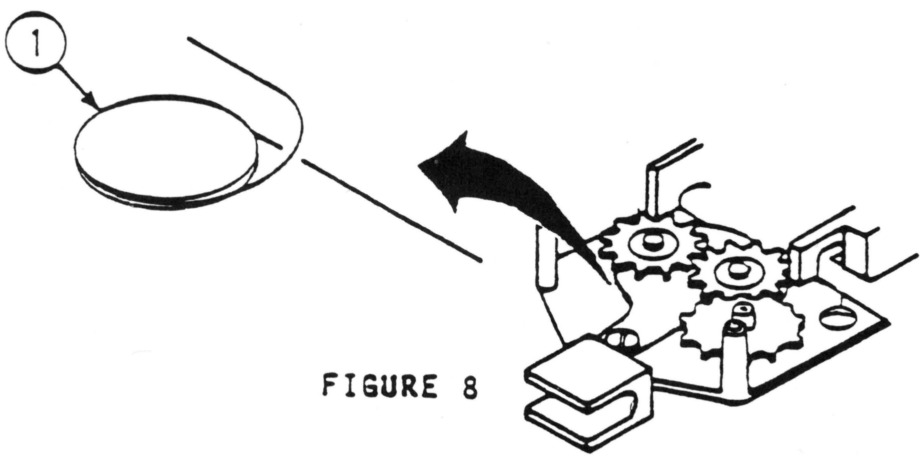


FIGURE 8

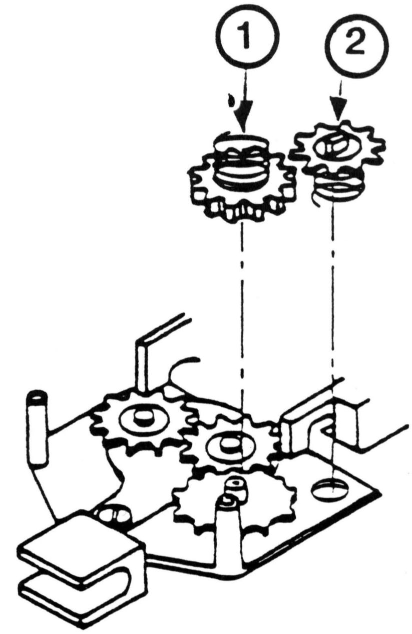


FIGURE 9

11. Loosen the screw on the ribbon wire arm on the left side of the printer (See Figure 6, #1.) Just give it a few turns to ease the tension on the wire.

12. Remove the wire from the wire holder on the right side of the printer. (See Figure 7, #1.)

13. Remove the other end of the wire from the wire holder on the left side of the printer.

14. Work the wire free from the ribbon pulley gear. Pull the wire out of the printer.

Replace:

1. Attach one end of the ribbon wire to the wire holder on the right side of the printer.

2. Work the wire around the pulley gear as shown. (See Figure 8, #1.)

3. Attach the other end of the ribbon wire to the wire holder on the left side of the printer.

4. Tighten the ribbon wire arm.

5. Replace the ratchet spring and ratchet gear. (See Figure 9, #1.)

6. Replace the ribbon spring and cassette drive gear. (See Figure 9, #2.)

7. Replace the cassette mount plate and ribbon cassette.

8. Replace the top cover, carrier cover, and platen knob.

9. Run the self-test.

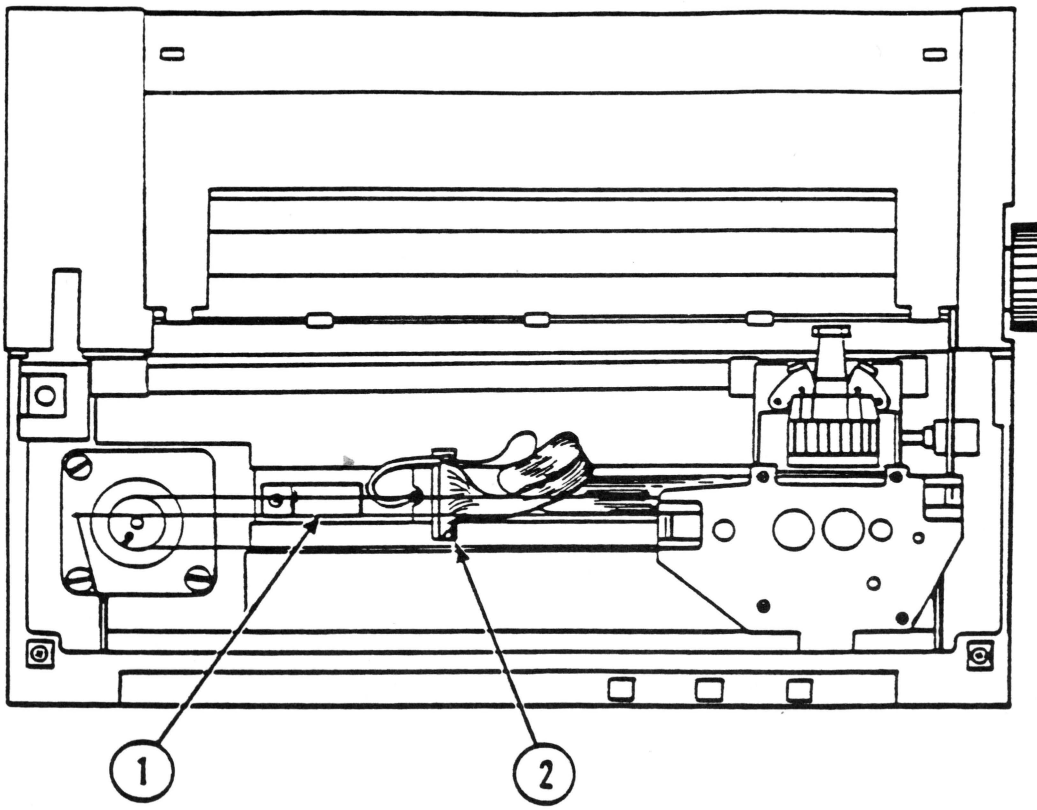


FIGURE 1

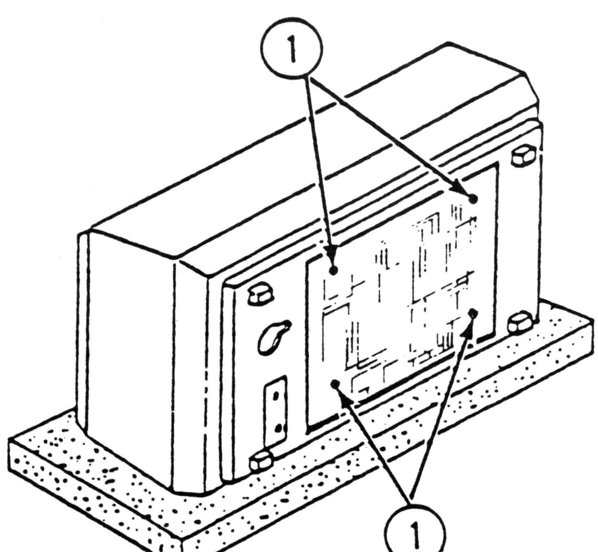


FIGURE 2

C. REMOVE/REPLACE THE CPU PC BOARD

For these procedures you will need:

5.5mm Nutdriver
8mm Nutdriver
Phillips Screwdriver

Remove:

1. Disconnect the power cord.

2. Remove the carrier cover, the paper cover and the platen knob.

3. Remove the top cover. Be sure to detach the switch panel connector from the CPU PC board. Put the cover somewhere out of the way.

4. Slide the carrier all the way to the right.

5. Loosen, but do not remove, the metal clip and gently pull up the ribbon until you can reach the dot head connector. (See Figure 1, #1.)

6. Gently work free the dot head connector. (You might use the needle nose pliers to grasp the connector.) (See Figure 1, #2.)

7. Tuck the dot head connector under the cable so it stays out of the way.

8. Using a pad or cushion for protection, set the printer on its back. (See Figure 2.)

9. Use a 5.5mm nutdriver to remove the four nuts from the bottom panel.

10. Pull off the panel.

11. Use an 8mm nutdriver to remove the four CPU PC board nuts. (See Figure 2, #1.)

12. Gently pull the board toward you. This will help you reach the plastic connectors on the board.

13. Using your fingers, work off the plastic connectors. (Do not pull on cable.) As you disconnect them, note the position of each connector.

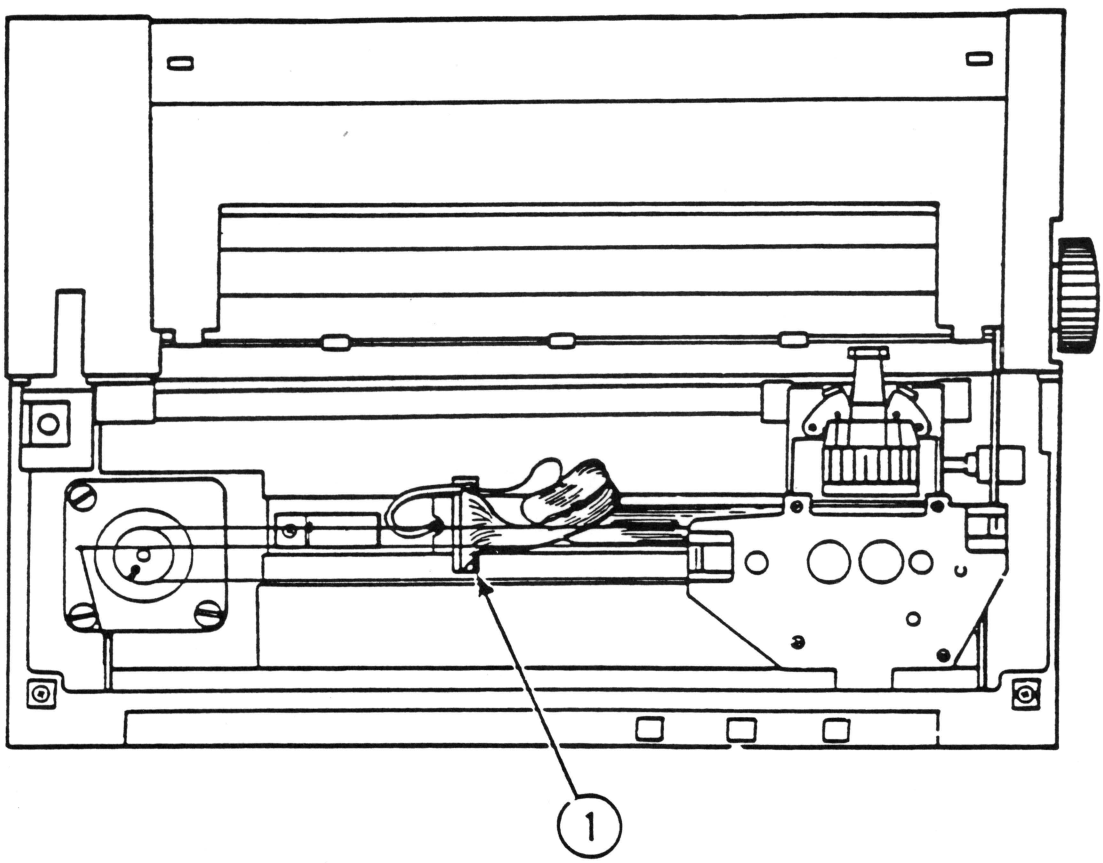


FIGURE 3

CAUTION: THE BOARD CAN BE DAMAGED BY STATIC ELECTRICITY.

14. When you have all the connectors off, lay the board down on table.

15. Slide the grounding strap from the ground lug.

16. To avoid damaging the board, be careful not to handle the surface of the board. When you carry away the board, be sure to hold it by its edges.

Replace:

1. Line up the board with printer.

2. Connect the grounding strap.

3. Connect the six plastic connectors.

4. Replace the four CPU PC board nuts.

5. Push the bottom window back into place. Connect the four window nuts.

6. Turn the printer right side up.

7. Push the dot head connector back into CPU PC board. (See Figure 3, #1.)

8. Fold the dot head cable under the metal clip. Tighten down the metal clip.

9. Slide the carrier back and forth a few times. It should slide freely from end to end. If the carrier catches on the metal clip, go back and re-fold the dot head cable.

10. Replace the top cover. Be sure to plug the switch panel connector back into the CPU PC board.

11. Replace the carrier cover, the paper cover, and the platen knob.

12. Turn the power on.

13. Perform the self-test.

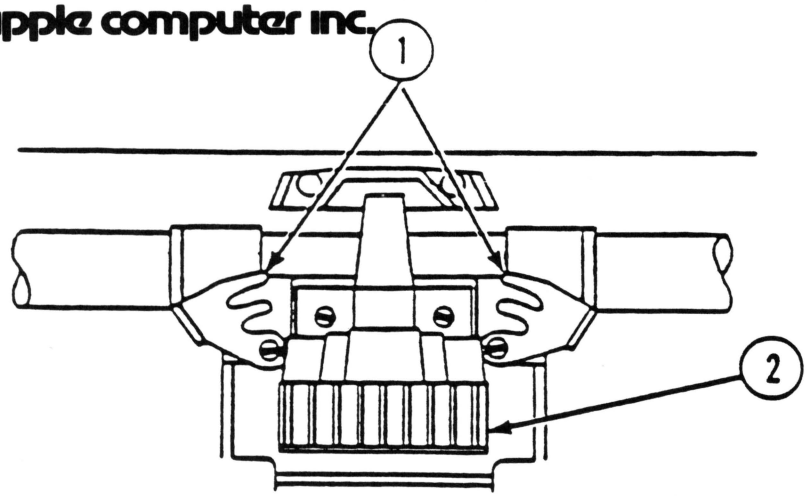


FIGURE 1

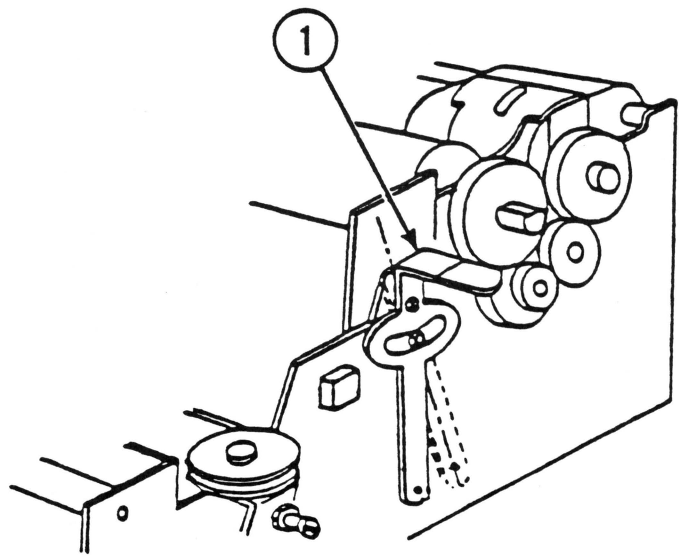


FIGURE 2

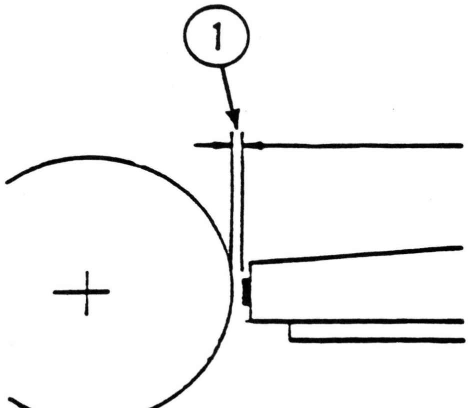


FIGURE 3

D. REMOVE/REPLACE AND ADJUST THE DOT HEAD

For these procedures you will need:

.06mm feeler gauge

Remove:

1. Disconnect the power cord.

2. Remove the carrier cover.

3. Remove the ribbon cartridge (Section 1A, page 1.5).

4. To free the dot head, slide out both dot head latches. (See Figure 1, #1.)

5. Pull up the dot head. (See Figure 1, #2.) If you have trouble getting it out, pull the paper roller shaft forward. Ease the dot head around the roller shaft.

Replace:

1. Push in the dot head. If you have trouble getting it in, pull the paper roller shaft forward. Ease the dot head around the roller shaft.

2. To lock the dot head in place, slide in the two dot head set latches.

Adjust:

1. Push in on the head adjusting lever until it is pointing up. (See Figure 2, #1.)

2. Using a feeler gauge, check that the gap between the head needle and the platen is .06mm or .024 +/- .001 inches. (See Figure 3, #1.) This is the right gap for a single sheet of paper. Try sliding through the platen a single sheet of paper. It should go through with just a little drag.

3. If the gap is off, adjust the head adjusting lever until the gap is correct.

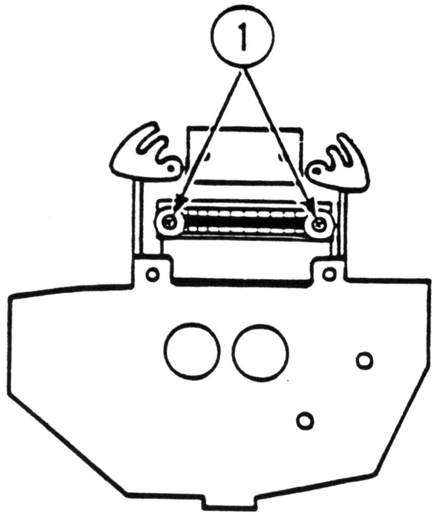


FIGURE 4

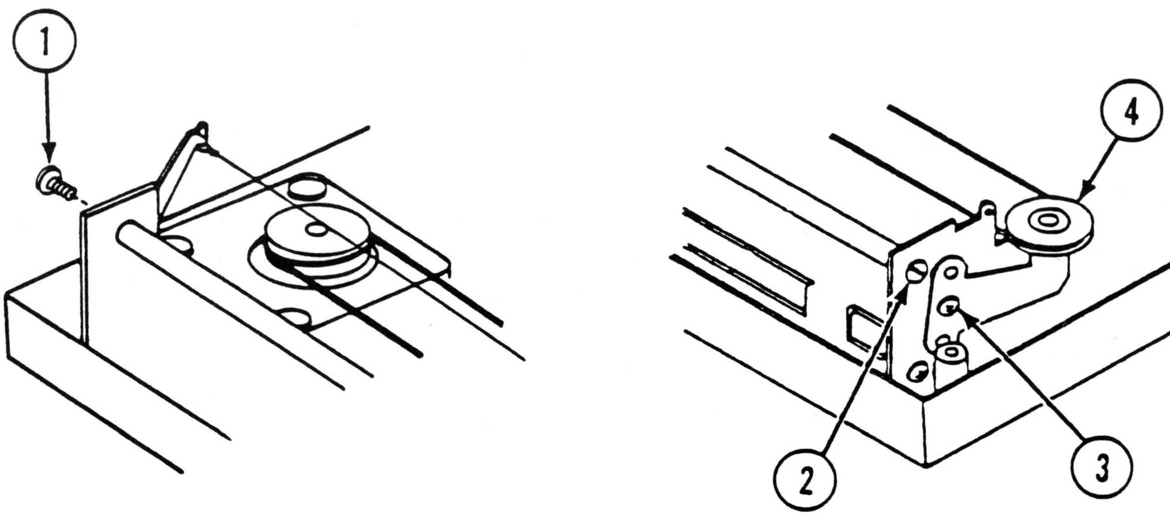


FIGURE 5

E. REMOVE/REPLACE THE CARRIER WIRE

For these procedures you will need:

Small Phillips screwdriver
Small flat blade screwdriver
Needlenose pliers
Adjustable wrench
Tension gauge
Pulley Remover
Ruler

Remove:

1. Disconnect the power cord.
2. Remove the paper cover, the carrier cover, and the top cover. Set the top cover somewhere out of the way.
3. Remove the dot head (Section 2D, page 2.15).
4. Remove the two screws holding the dot head connector. (See Figure 4, #1.)
5. Lift up the connector and move it out of the way.
6. Free both ends of the ribbon wire. Loop the ends over the carrier and tie them together out of the way.
7. Remove the screw on the left end of the carrier guide shaft (See Figure 5, #1) and set aside the ribbon wire arm.
8. Remove the screw on the right end of the shaft. (See Figure 5, #2.)
9. Pull out the carrier guide shaft.
10. Move the carrier to the right side.

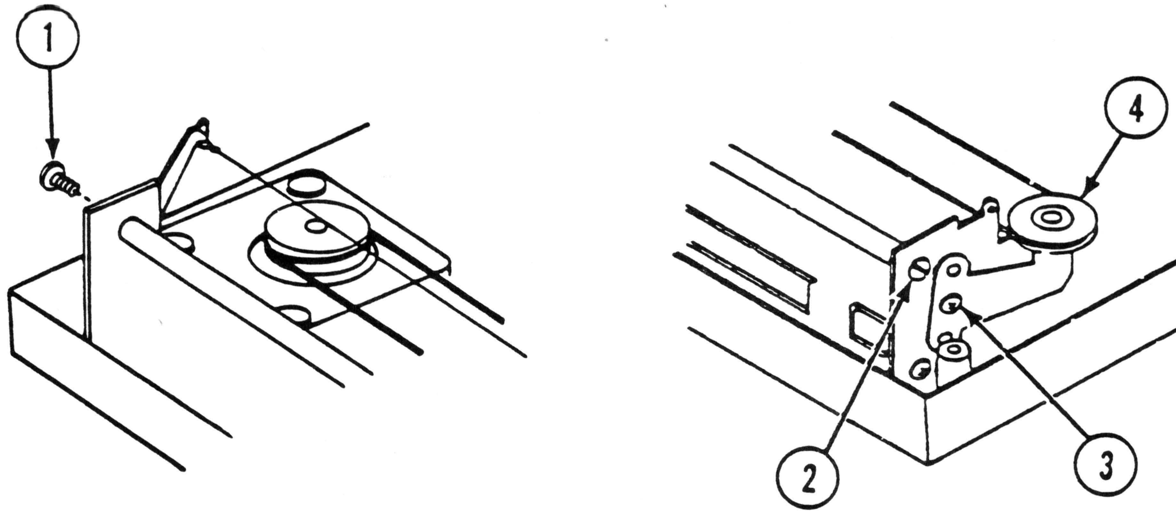


FIGURE 6

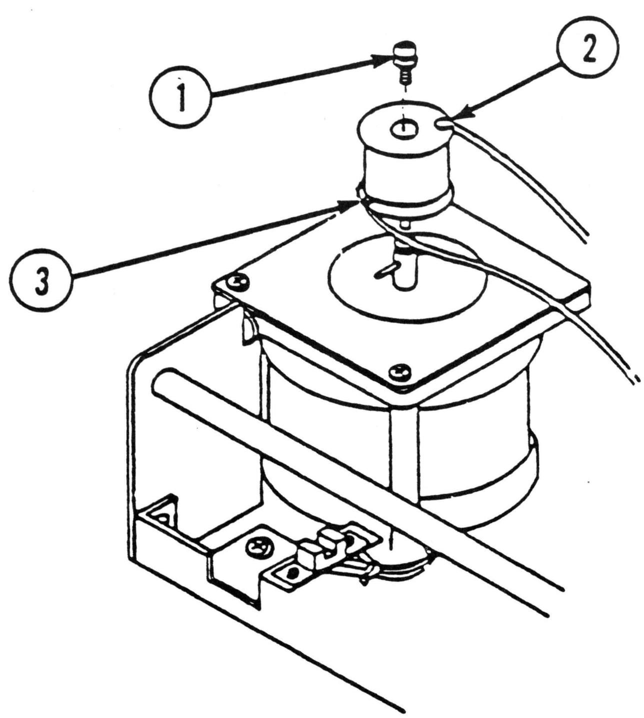


FIGURE 7

11. Use a phillips screwdriver to remove the screw from the top of the motor pulley. (See Figure 7, #1.)

    NOTE: The pulley can be stopped from turning by holding the carrier in place.

12. Loosen the screw on the tension arm. (See Figure 6, #3.)

13. Slip off the wire from the idler pulley. (See Figure 6, #4.)

14. Remove the top end of the carrier wire. (See Figure 7, #2.)

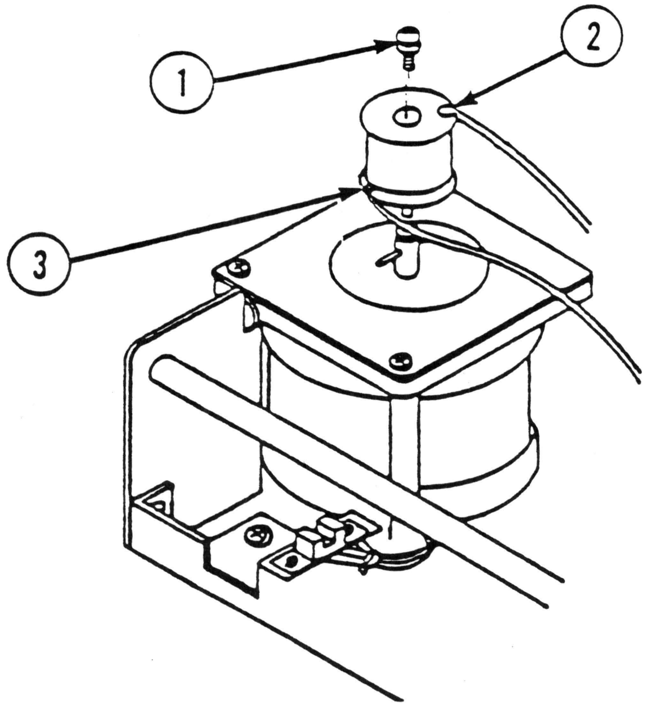


FIGURE 8

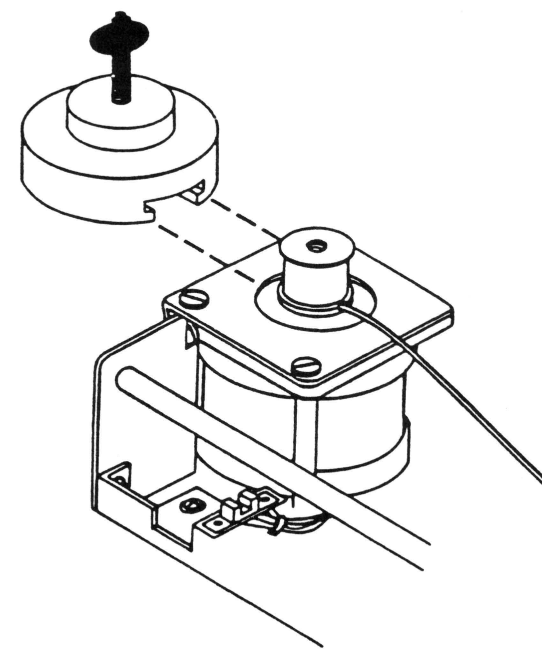


FIGURE 9

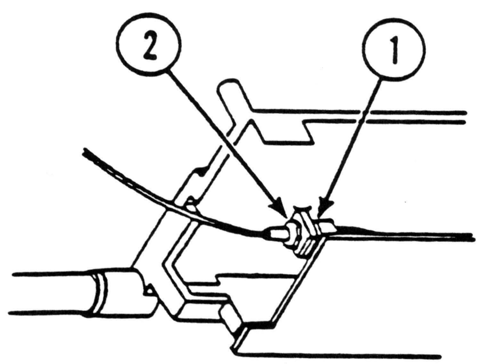


FIGURE 10

15. Use the pulley remover to take off the motor pulley. Slide the pulley remover onto the top of the pulley and turn the screw clockwise until the pulley is free. (See Figure 9.)

    NOTE: At this time, make sure that two copper shims are on the arms of the motor pulley shaft.

16. Unwind the carrier wire.

17. Remove the bottom end of the carrier wire from the motor pulley. (See Figure 8, #3.)

18. Raise up the carrier.

19. Using an adjustable wrench, hold the nut on the right side of the carrier wire in place. (See Figure 10, #1.) Using a needlenose pliers, remove the wire nut on the left side of the carrier wire. (See Figure 10, #2.)

20. Grab the carrier wire on either side of the black rubber sleeve. Pull out the carrier wire, the nuts, and the sleeve.

    NOTE: When you remove the carrier wire, first push out the metal shim which is inside, then the wire, the two nuts, and the black rubber sleeve will all come out together. The wire does not slide out of the two nuts. You must pull the wire, the nuts, and the sleeve out of the slot at the bottom of the carrier assembly.

Replace:

1. Raise up the carrier.

2. Before you insert the new carrier wire, make sure that the long end of the wire runs toward the right side of the printer.

3. Push the black rubber sleeve and metal shim back into the slot at the bottom of the carrier assembly. Tighten the wire nut.

4. Take the long end of the wire and wrap it around the idler pulley. The idler pulley is on the far right side of the printer.

5. Work the long end of the wire under the carrier assembly until it reaches the left side of the printer.

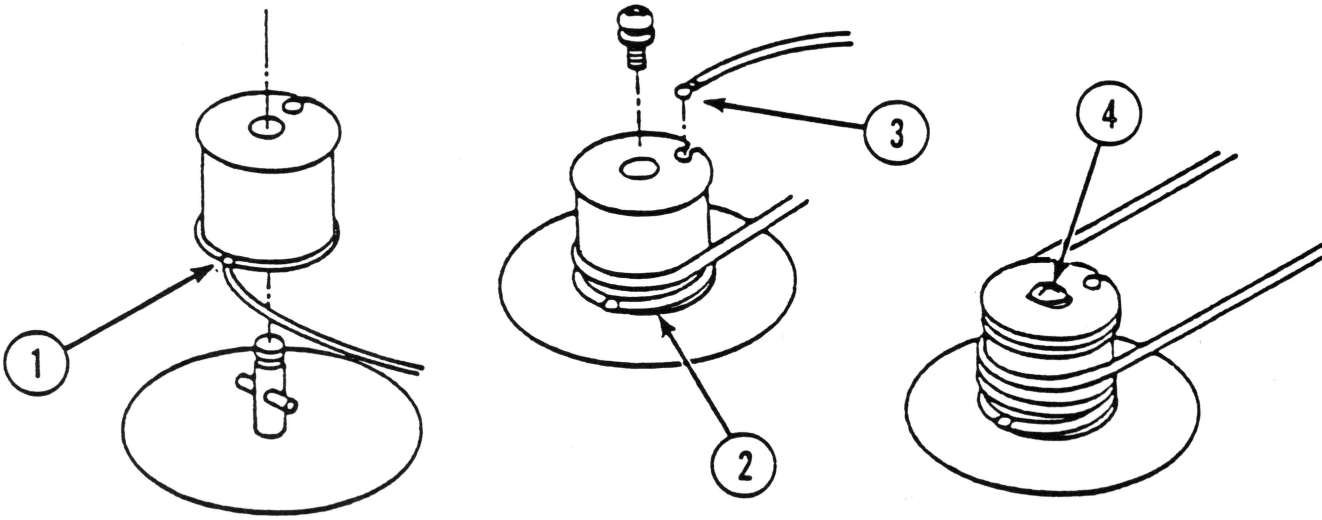


FIGURE 11

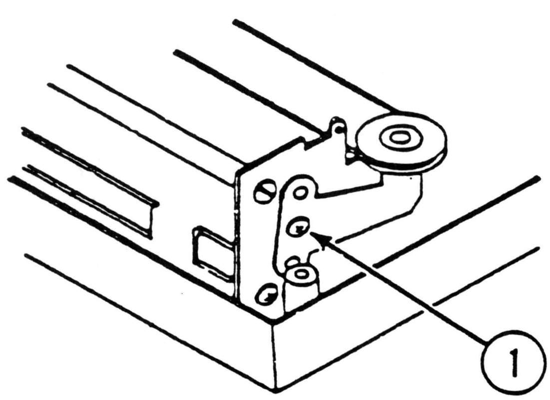


FIGURE 12

6. Insert the long end of the wire into the bottom slot on the motor pulley. (See Figure 11, #1.)

7. Make sure that the two copper shims are still on the arms of the motor pulley shaft.

8. Seat the motor pulley on the shaft. (See Figure 11, #2.)

9. Hold the wire snug against the motor pulley with your thumb. Turn the pulley in a clockwise direction and wind up the carrier wire.

10. Insert the short end of the wire into the top slot of the motor pulley. (See Figure 11, #3.)

11. Wrap the wire around the pulley in a clockwise direction.

12. Replace the motor pulley screw. (See Figure 11, #4.)

13. Replace the front guide rail.

14. Tighten the tension screw until the wire is taut. (See Figure 12, #1.)

15. Replace the two front guide rail screws and ribbon wire arm.

16. Untie the ribbon wire.

17. Attach the right end of the ribbon wire to the ribbon wire post just above the idler pulley.

18. Attach the left end of the ribbon wire to the ribbon wire post just above the motor pulley.

NOTE: If the ribbon wire comes off of the ribbon pulley gear, you must put it back on. If you have forgotten how, see Section 2B, page 2.9.

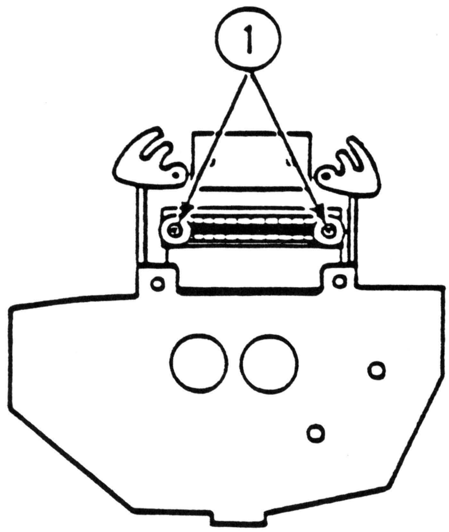


FIGURE 13

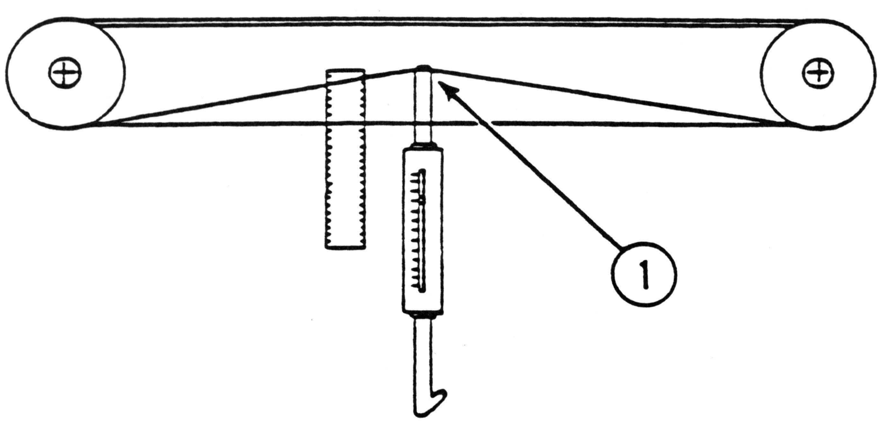


FIGURE 14

19. Replace the dot head connector. (See Figure 13, #1.)

20. Replace the dot head (Section 2D, page 2.15).

21. With the carriage assembly at the far left, push the carrier wire at its center with a tension gauge. (See Figure 14, #1.)

22. When the wire is slackened 3/8 of an inch at the center, check the gauge. It should read 1 LB. If it doesn't, adjust the screw of the tension arm.

23. Replace the top cover, the carrier cover, and the paper cover. Load paper and a ribbon cassette.

24. Run the self-test.

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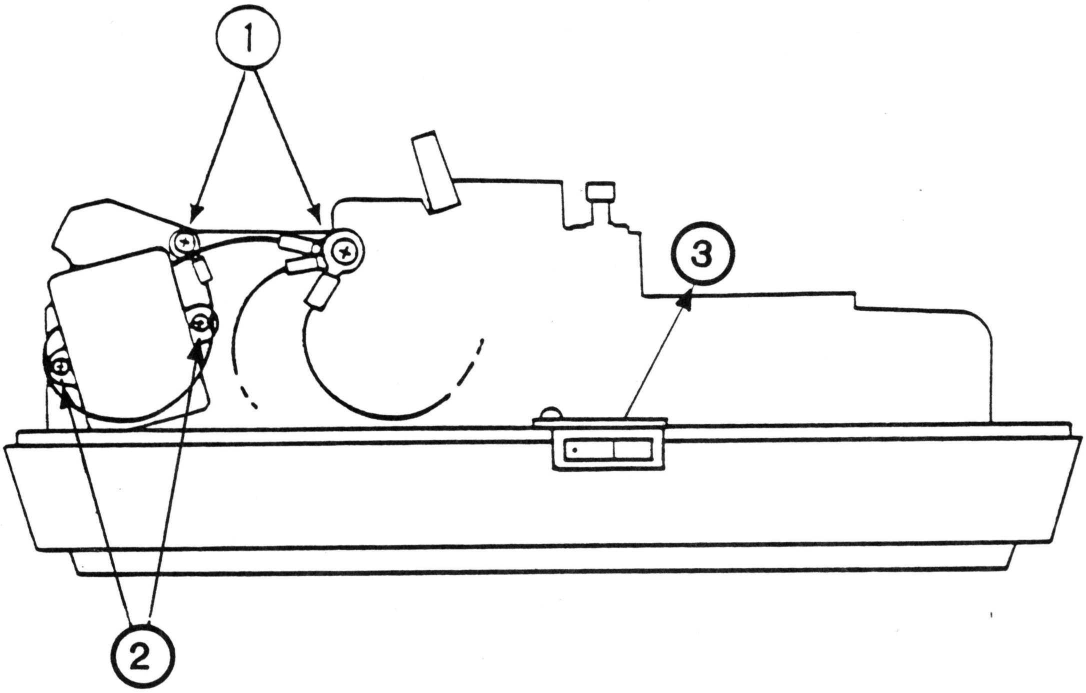


FIGURE 1

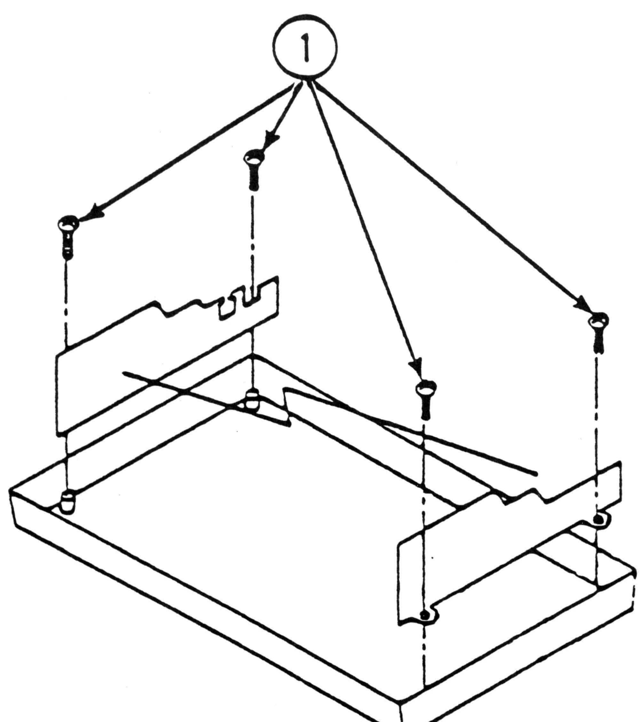


FIGURE 2

F. REMOVE AND REPLACE THE MECHANICAL ASSEMBLY

For these procedures you will need:

Small phillips screwdriver
5.5mm Nutdriver
8mm Nutdriver

Remove

1. Disconnect the power cord.
2. Remove the paper cover, the carrier cover, and the top cover. Set the top cover down out of the way.
3. Remove the CPU board (Section 2C, page 2.11).
4. Remove the screw and washers holding ground straps to the side frame. (See Figure 1, #1.)
5. Remove the two screws from the noise filter. (See Figure 1, #2.)
6. Gently pull the noise filter away from the frame.
7. Remove screw from plate over power switch. (See Figure 1, #3.)
8. Lift power switch out of its slot.
9. To free the mechanical assembly, remove the four screws holding it to the printer. (See Figure 2, #1.)
10. Lift the mechanical assembly out of the printer.

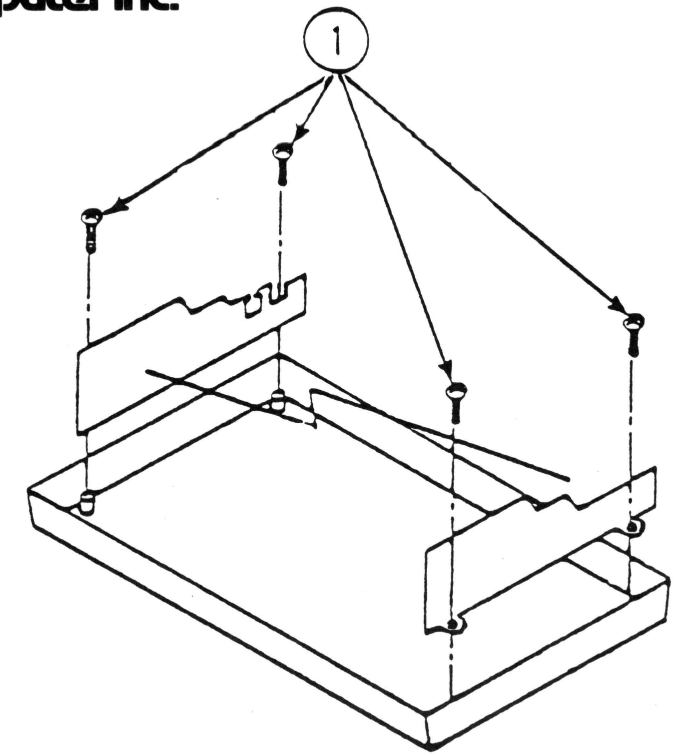


FIGURE 3

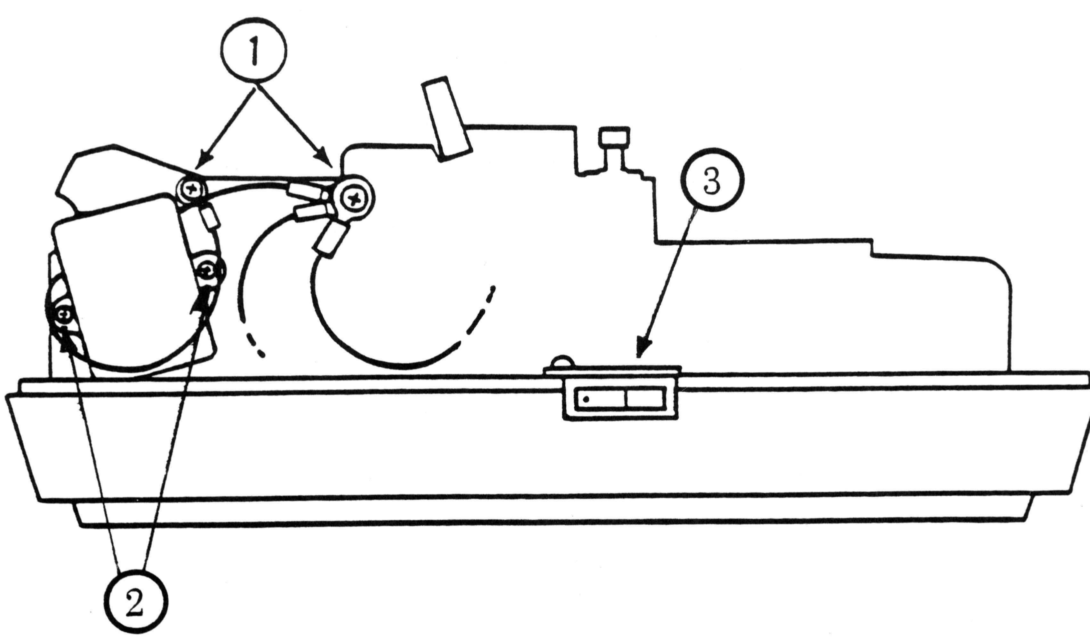


FIGURE 4

Replace

1. Put mechanical assembly back into the case.

2. Replace the four screws. (See Figure 3, #1.)

3. Position the noise filter on the frame. It goes at an angle (See Figure 4, #1.)

4. Replace the noise filter screws.

5. Put together the screw, washer, three ground cables, and star washer. Screw them into the side frame. Do the same with the fourth ground cable. (See Figure 4, #2.)

6. Put the power switch back into its slot.

7. Replace the plate over the power switch. (See Figure 4, #3.)

8. Replace the CPU board (Section 2C. page 2.13).

9. Replace the top cover, carrier cover, and paper cover.

10. Load paper and ribbon cassette.

11. Power on and perform the self-test.

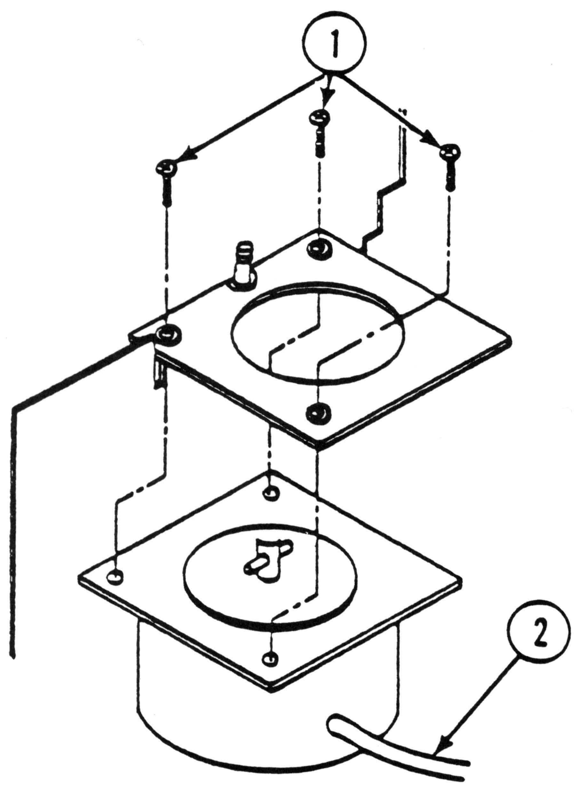


FIGURE 3

REMOVE AND REPLACE THE CARRIER MOTOR

Medium flat blade screwdriver
Phillips screwdriver
Pulley remover

Remove:

1. Make sure the power is off.

2. Remove the mechanical assembly from the printer.

3. Loosen the ribbon wire tension arm.

4. Free the ribbon wire from the two ribbon wire posts.

5. Tie the wire in a loose knot over the carrier.

6. Remove the motor pulley as you did in Section 2E, page 2.17.

7. Remove the three motor mounting screws. (See Figure 3, #1.)

   NOTE: When you remove the last screw, the motor will drop out of the mechanical assembly. As you remove the last screw, hold on to the motor. Carefully note the position of the motor cable. (See Figure 3, #2.) Then let motor fall free.

Replace:

1. From the front side of the mechanical assembly, put the motor in its slot. Make sure the cable is on the right side of the motor. It should be pointing in the general direction of the idler pulley.

2. Replace the three motor mounting screws. Do not over tighten them.

3. Replace the motor pulley. If you have forgotten how, see Section 2E, page 2.17.
4. Put the motor pulley back on the motor.

5. Replace the motor pulley screw.

6. Untie the ribbon wire.

7. Fix the ribbon wire to the ribbon wire posts.

8. Tighten the ribbon wire arm.

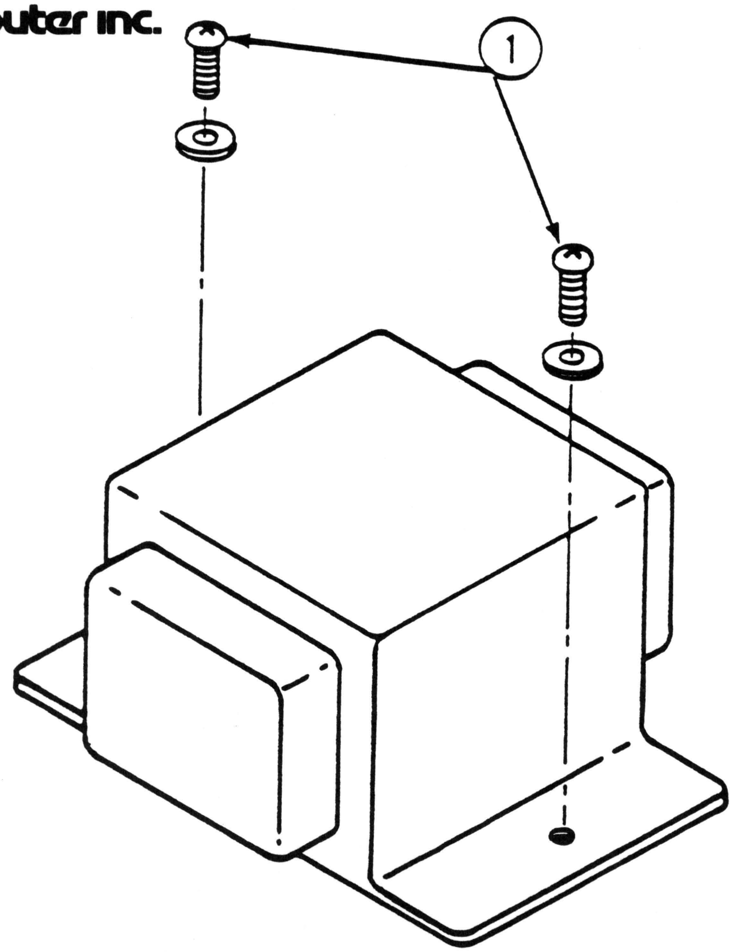


FIGURE 1

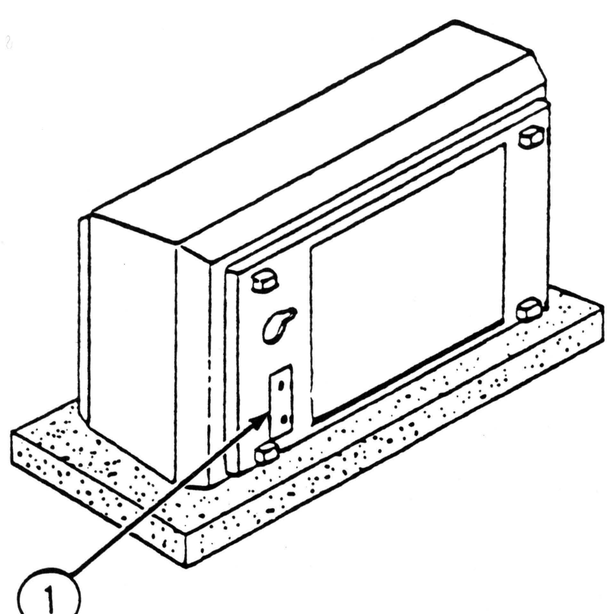


FIGURE 2

H. REMOVE AND REPLACE THE TRANSFORMER

For these procedures you will need:

Needlenose pliers
Small Phillips screwdriver

Remove:

1. Remove the mechanical assembly (Section 2F, 2.27).

2. Remove the two screws from the transformer. (See Figure 1, #1.)

Replace:

1. Make sure the threaded plate under the bottom of the printer is in position. (See Figure 2, #1.)

2. Put the transformer in place.

3. Screw down the transformer.

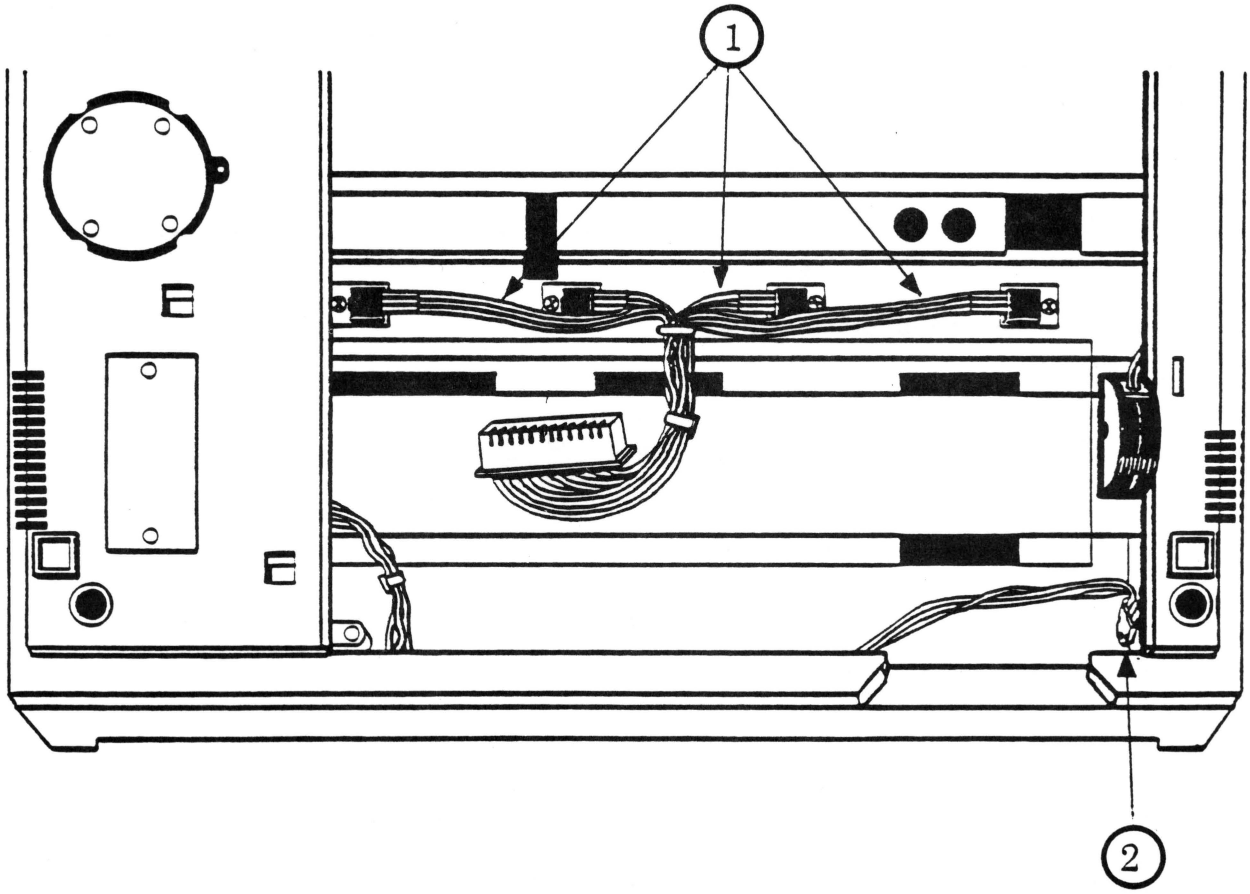


FIGURE 4

I. LOCATE THE CARRIER MOTOR DRIVER TRANSISTOR

1. Remove the mechanical assembly (Section 2F, page 2.27).

2. Turn the mechanical assembly upside down and place it on a protective pad.

3. Note the location of the transistor assembly in Figure 4, #1.

J. REMOVE AND REPLACE THE VOLTAGE REGULATOR TRANSISTOR

For this procedure you will need:

Heat sink compound
Phillips head screwdriver

1. Remove the mechanical assembly (Section 2F, page 2.27).

2. Turn the mechanical assembly upside down and place it on a protective pad.

3. Remove the screw from the voltage regulator transistor (Figure 4, #2) and carefully remove the transistor.

4. To replace the voltage regulator transistor spread a thin layer of heat sink compound on the mechanical assembly. Place the sheet of mylar on top of it. Apply a layer of heat sink compound on top of the mylar, and screw on the transistor.

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Dot Matrix Printer Technical Procedures

Section 3

Troubleshooting

Contents:

	SYMPTOM TABLE
SYMPTOM	**CORRECTIVE ACTIONS**
NO POWER	1. Check that the power cord is plugged in. 2. Check if the power fuse at the back of the printer is burned out. If it is, replace it and power on again. If the fuse blows a second time, swap components in this order: • Regulator transistor • CPU PC board • Carrier Motor • Transformer 3. If the fuse is O.K., you may have a bad power switch. Try replacing it. If that doesn't take care of the problem, swap the Carrier Motor and then the Transformer.
POWER COMES ON BUT PRINTER WON'T PRINT	1. Check if the top cover is seated properly. If it isn't, close it. Then press SEL and try self-test. 2. Check if PE lamp is lit on front panel. If it is, reload the paper and try self-test. 3. Check the connectors between the carrier and carrier motor and the CPU PC board. If any of the connectors are loose, connect them. 4. Try swapping components in this order: • CPU PC board • Carrier motor • Transistor assembly
PRINTER PASSES SELF-TEST BUT WON'T PRINT UNDER COMPUTER CONTROL	1. Check that the computer is properly powered on and initialized. 2. Make sure there isn't a software problem. 3. Make sure that the interface cable between the printer and the computer is connected at both ends. 4. Check if SEL light is on. If it's off, press SEL and try printing under computer control. If it prints while light is off, replace the switch panel. 5. Replace CPU PC board.

	SYMPTOM TABLE
SYMPTOM	**CORRECTIVE ACTIONS**
PRINT QUALITY PROBLEM: DOTS MISSING	1. Make sure dot head is in place. 2. Make sure dot head is not clogged with dust or dirt. 3. Make sure dot head connector is plugged properly into CPU PC board. 4. Make sure gap adjustment lever is set properly. 5. Try replacing components in this order: ● Dot head ● CPU PC board
PRINT QUALITY PROBLEM: PRINTING TOO LIGHT	1. Check if ribbon is old, torn, frayed, or twisted. 2. Check if ribbon wire tension is too loose and adjust as necessary. 3. Check if gap adjustment lever is set properly. 4. Adjust intensity pot. To do this, lift the clear plastic sheet that covers the configuration switches. Locate VR2 IMPRES. Insert a screwdriver into the slot on VR2. Turn the screwdriver. 5. Try replacing components in this order: ● Ribbon cassette ● Dot head ● CPU PC board
PRINT QUALITY PROBLEM: CHARACTERS NOT SPACED PROPERLY	1. Check if carrier wire is strung properly. 2. Try swapping components in this order ● Carrier wire ● Carrier motor ● CPU PC board

	SYMPTOM TABLE
SYMPTOM	**CORRECTIVE ACTIONS**
PRINT QUALITY PROBLEM: CHARACTERS DO NOT ALIGN VERTICALLY BETWEEN ROWS	1. Adjust bidirectional pot. To do this, push back the clear plastic sheet the covers the configuration switches. Locate VR1 ALIGN. Insert a a screwdriver into the slot on VR1. Turn the screwdriver.
CARRIER ASSEMBLY MOVING ERRATICALLY: CARRIER SHAKING, MOVING SLOWLY, OR GIVING OFF BURNING ODOR	1. Try swapping components in this order ● Carrier motor ● Transistor assembly ● CPU PC board

Daisywheel Printer

APPLE DAISY WHEEL PRINTER

TECHNICAL PROCEDURES

TABLE OF CONTENTS

Apple Daisy Wheel Printer
Technical Procedures

Section 1

Basics

Contents:

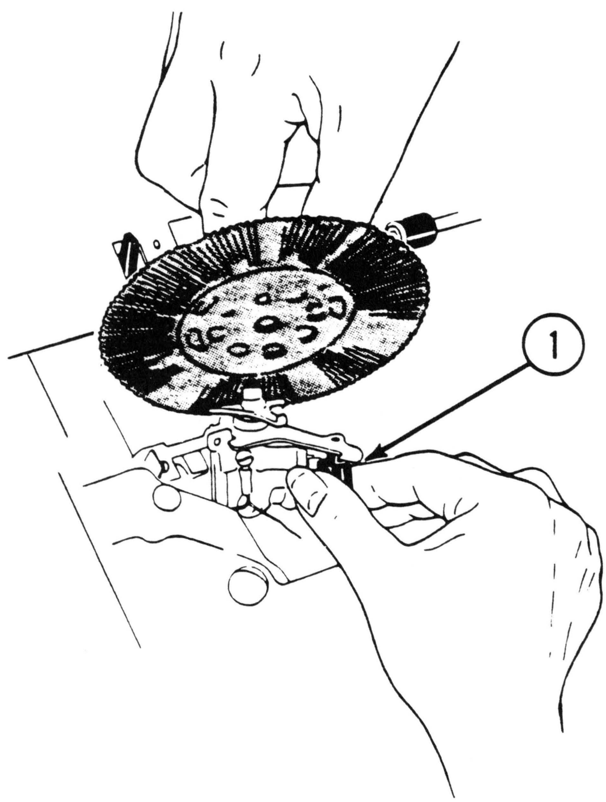


FIGURE 1

A. OPERATOR TASKS

1. **To remove the ribbon cartridge**, remove the access panel. Press down on the small levers on either side of the ribbon cartridge and lift the cartridge out. Put it aside.

2. **To remove the printwheel**, press the lever on the print hammer assembly (see Figure 1, #1) towards the hammer and tilt the assembly back towards you. Grasp the knob in the center of the printwheel and pull the printwheel off the assembly. Set it aside for now.

3. For other operator tasks, see the User's Manual.

B. SETTING USER SWITCHES

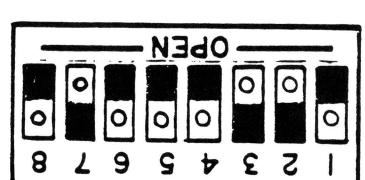
These switches are found at the front of the printer, behind the LED panel. The reference card in the user manual gives the proper settings; the information below tells how to read and set the switches. When you install a printer, you should set the switches according to the needs of the customer; the customer will be able to change their setting for special jobs using the reference card in the operator manual.

Note that **depressing** a switch on the side closest to "OPEN" sets a **zero** value, while the side having the switch numbers (1 through 8) will set a **one** value.

IMPORTANT: The switches should be read left to right, as they appear to you when you look from the front of the printer, **even if the printing on the switch looks upside-down or backwards.** For example, if the settings you wanted were:

Line Feed (number of lines per inch)	8	0
Auto LF after carriage return	ON	1
Form Length	3 1/2"	0001
Spacing (characters per inch, "type pitch")	15	10

then the numerical setting of the switches would be 01000110, and the switch should appear as follows:



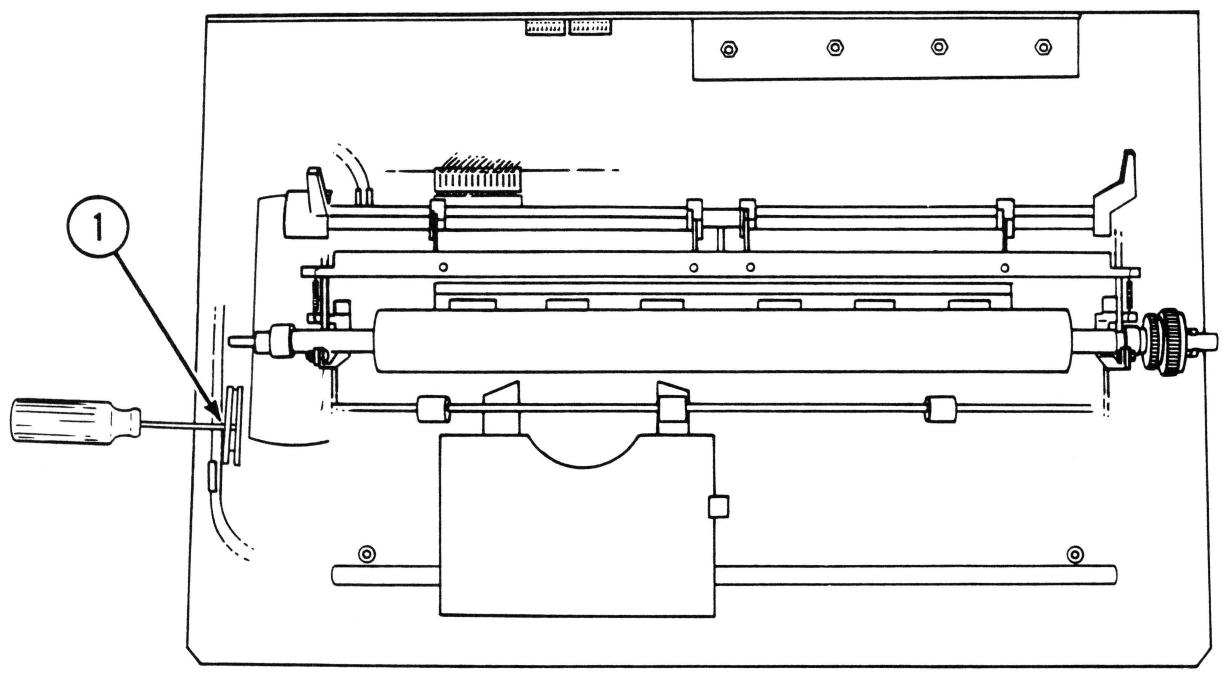


FIGURE 2

C. PRINT QUALITY CHECK - TERMINAL SELF-TEST

A successful Terminal Self-Test indicates that the printer is working properly. All covers should be in place, and paper (11 inches wide) installed prior to test start.

To run a terminal self-test without replacing the covers, you can defeat the top cover interlock switch as follows: Find the switch housing on the left side of the printer (Figure 2, #1). Push down on the switch lever inside the housing with a screwdriver, and then insert a small phillips screwdriver or a paperclip through the hole in the switch housing, to hold the lever down.

Before performing the test,

1. Make sure that the printwheel and ribbon installed on the printer are not defective or worn.

2. Make sure that the Multicopy Select lever is in the full forward position (toward the operator).

To Perform a Terminal Self-Test:

3. a) Press and hold the Pause switch as you turn on power.

   b) After the carriage has reached the left margin, release the switch and the printer will print a short report of switch settings and internal tests, and then all characters on the print wheel.

   c) to stop the test you may:

      turn power off, or

      press and hold Pause switch as printer nears the completion of a line of characters.

4. Inspect the printed characters. All characters, numerals and symbols should print with equal ink density on their left and right sides, and on top and bottom. The quality of characters printed on the left side of the platen should be identical to the quality of characters printed on the right side.

If the print quality does not meet these standards, the platen or print hammer needs adjustment. See section 3 (below) for the adjustments.

NOTE: If you have trouble judging side to side print quality with this test, another self-test prints a "barber pole" pattern that allows you to see how each character prints at each platen location. To run that test, follow the procedures above but press the Form Feed switch rather than the Pause switch.

D. REMOVING AND REPLACING THE TOP COVER

To perform Field Service Maintenance, you often need to remove the top cover. But since the power supply board is not shielded, always make sure the power is off and the power cord is disconnected before you remove the top cover.

Remove:

1. Remove power and disconnect power cord.

   WARNING: THE AC POWER CORD MUST BE DISCONNECTED BEFORE THE TOP COVER ASSEMBLY IS REMOVED. LETHAL VOLTAGES ARE PRESENT ON THE POWER SUPPLY PRINTED CIRCUIT BOARD.

2. Remove access panel.

3. Remove the two screws on the rear of the printer.

4. Loosen completely but do not remove the two screws near the front of the printer (one on either side).

5. Pull off platen knob.

6. Lift cover.

Replace:

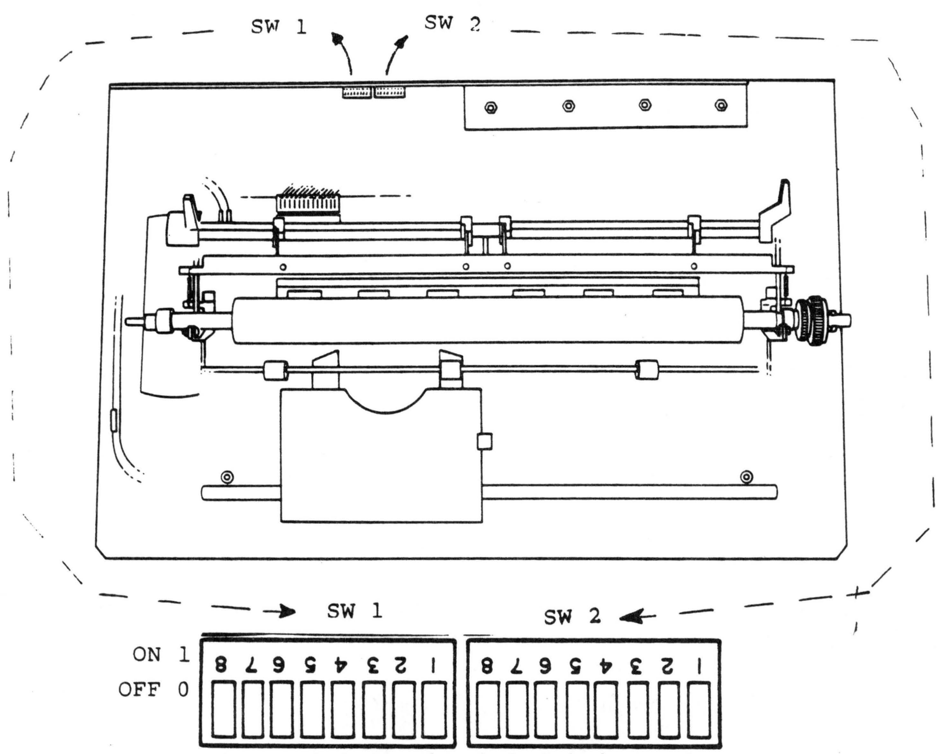
1. Lower top cover into place.

2. Tighten the two front retaining screws. Replace and tighten the two rear screws.

3. Return platen knob.

4. Return access panel.

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SW 1

PARITY

SPACE	=	11
MARK	=	10
EVEN	=	01
ODD	=	00

NO MODEM (LOCAL HOST)	=	1
MODEM	=	0

Handshake

EXT/ACK	=	00
XON/XOFF	=	01
DTR	=	10
N/A	=	01

Baud Rate

110	=	000
150	=	001
300	=	010
600	=	011
1200	=	100
2400	=	101
4800	=	110
9600	=	111

SW 2

LANGUAGE

Apple ASCII	=	0000
Apple WP	=	0001
Italy	=	0010
Sweden	=	0011
England	=	0100
France	=	0101
Germany	=	0110
Spain	=	0111

BI-DIR PRINT
AUTO CR/LF
DUPLEX
PAPER OUT

ON=1
OFF=0

FIGURE 3

E. SET CONFIGURATION SWITCHES

The two configuration switches are located at the top of the main PCB (see Figure 3). The operator is not supposed to set them: as part of an installation, you will set these switches according to the host system specifications and the needs of the customer. Normally the settings will not be changed unless there are technical changes to the host system.

To set the switches, unplug AC power and remove the top cover. Then use Figure 3 and the specifications given on the reference card in the user's manual to set the switches.

Note that the terminal self-test begins by printing the setting of the user and configuration switches. The following code is used:

1 = ON = switch set toward **rear** of printer
0 = OFF= switch set toward **front** of printer

The switches should be read from left to right, as you look at them from the front of the printer. They will appear in that order on the Terminal Self-Test printout.

APPENDIX A

FIELD SERVICE TOOL KIT

3/16 inch box wrench

1/4 inch box wrench

11/32 inch open end wrench

5/8 inch open end wrench

1/4 inch nutdriver

Large needlenose pliers

Small flat tip screwdriver

Medium flat tip screwdriver (with narrow, non-spade head)

Phillips screwdriver

Apple combination gauge (P/N 077-0015)

Ruler (12 inch)

Spring scale (P/N 077-0014) or small 1 lb. weight

Feeler gauge (.001 to .004)

.072 flute spline wrench

Clean, dry cloth

Cotton swabs for cleaning and lubrication

Apple Daisy Wheel Printer
Technical Procedures

Section 2

Take-apart

Contents:

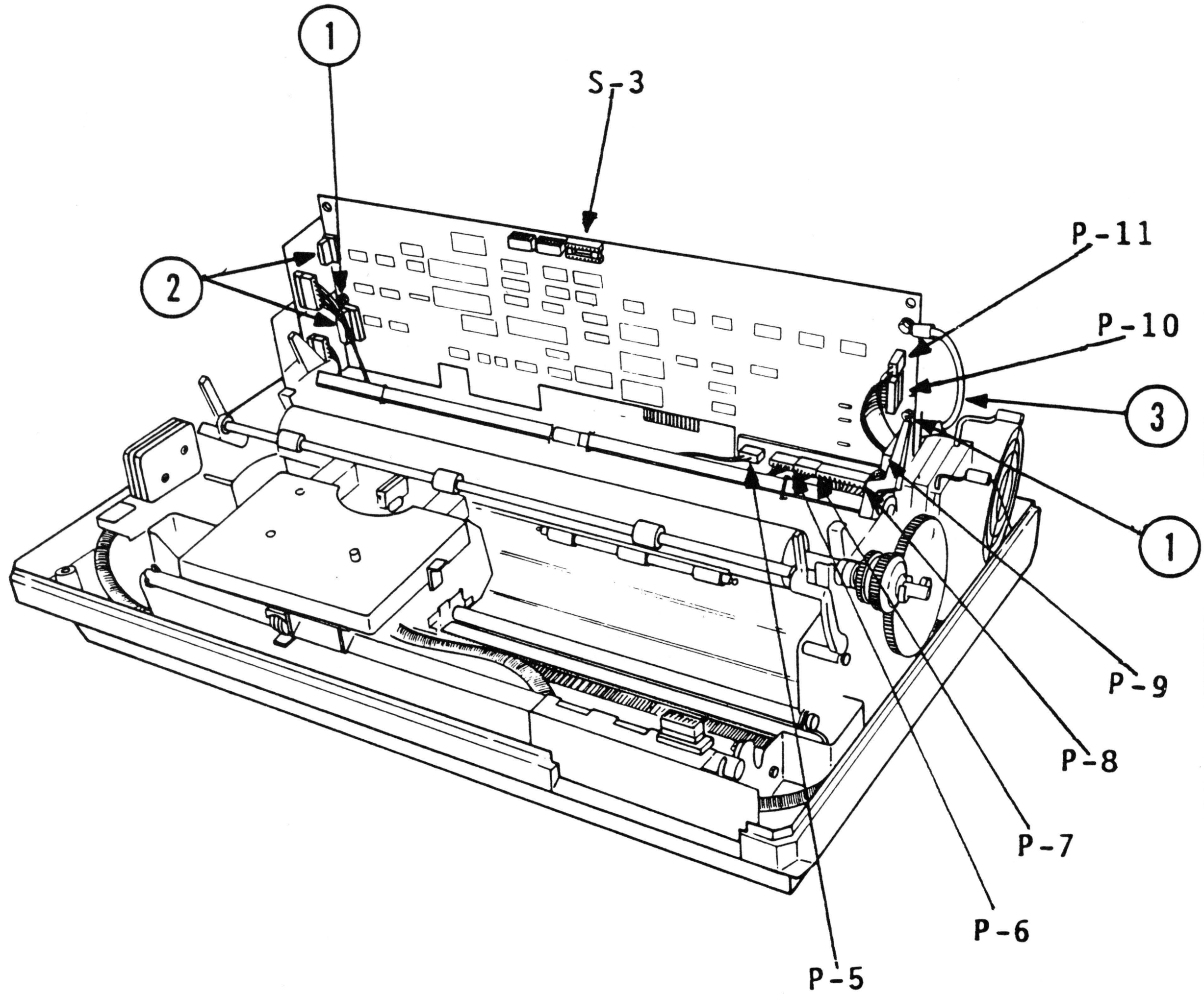


FIGURE 1

A. REMOVE AND REPLACE MAIN PCB

There are four printed circuit boards in the Apple DWP. The main PCB is at the rear of the printer.

To Remove:

1. Disconnect the AC power cord.

2. Remove top cover.

3. Unplug the ribbon cable from jack S-3 (top center of PCB).

4. Disconnect the ground wire from the upper right side of the PCB (see Figure 1, #3).

5. The main PC board is held by two white fasteners. Pull one fastener away from the board and hold it as you push the board away from the fastener with your other hand. Repeat for the other side.

6. There are two mounting holes midway between the top and bottom of the board. Install the board on the fasteners using these mid-point holes. (See Figure 1, #1.)

7. Unplug the two encoder PCB's from the extreme left side of the main PCB. (See Figure 1, #2.)

8. Carefully note the routing of cables to the main PCB, the remove the connectors from the jacks listed below:

Jack	No. of pins	Location
J-11	2 pin	
	2 empty pins	Right side
J-10	4 pin	
J-09	8 pin	
J-08	12 pin	
J-07	3 pin	
J-06	6 pin	Bottom right
	2 empty pins	
J-05	3 pin	
	3 empty pins	

9. Release main PCB from fasteners and remove it from printer.

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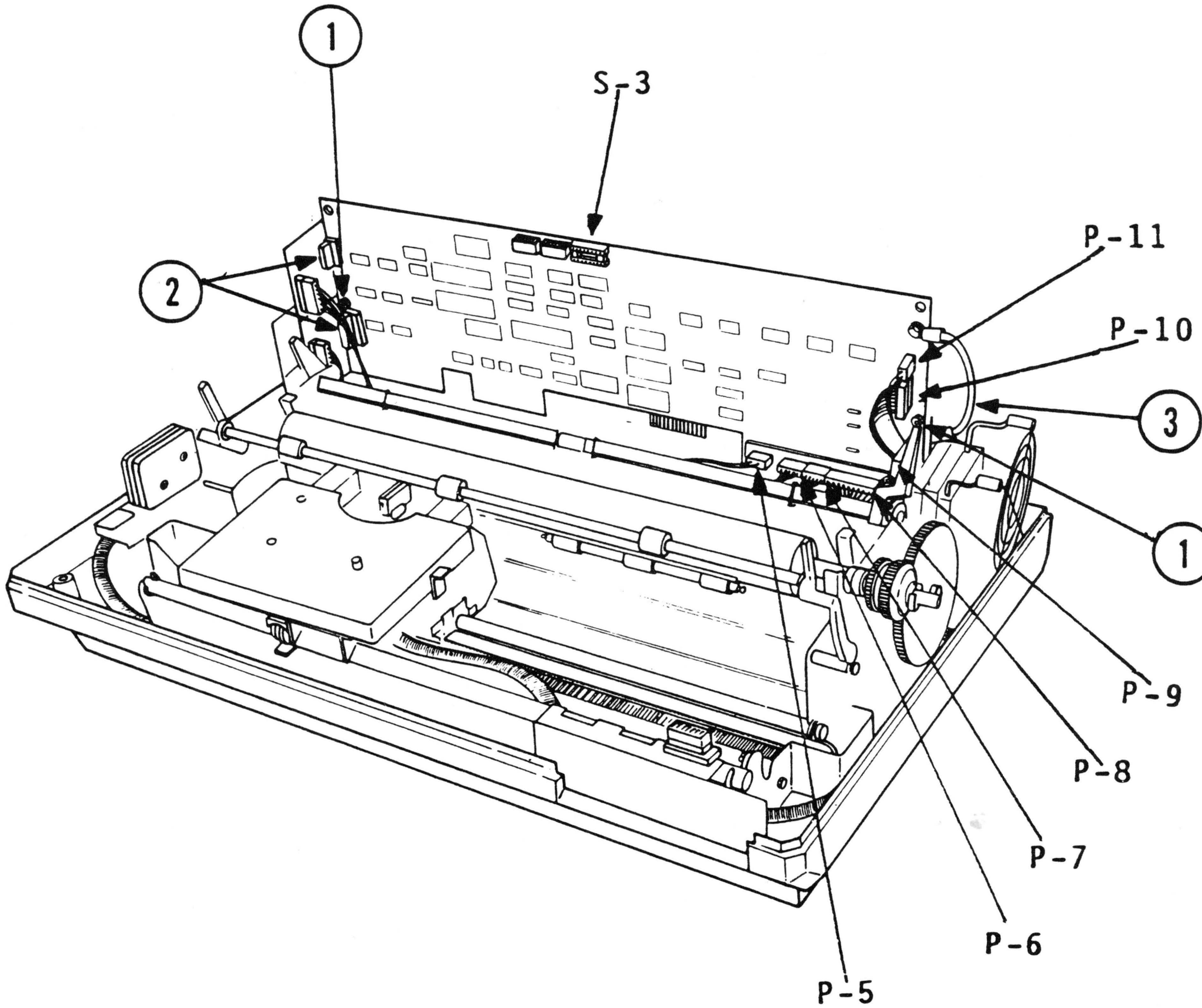


FIGURE 2

To Replace Main PCB:

1. Return main PCB to service position (use midpoint holes for the two fasteners). (See Figure 2, #1.)

2. Reconnect ground wire. (See Figure 2, #3.)

3. Replace connectors:

Jack	No. of Pins	Location	Other Information
J-11	2 pin		
	2 empty pins	Right side	
J-10	4 pin		
J-09	8 pin		
J-08	12 pin		
J-07	3 pin		
J-06	6 pin	Bottom right	
	2 empty pins		
J-05	3 pin		from cover interlock switch
	3 empty pins		

4. Plug in the two encoder PCB's. (See Figure 2, #2.)

5. Release PCB from work position, ease board down into its ready position and refasten. It is a tight fit, so you may need to jiggle it a bit or push in on its bottom edge to get it seated correctly.

6. Reconnect ribbon cable to jack S-3 (top center of PCB).

7. Defeat top cover interlock switch.

8. Reconnect AC power cord.

9. Switch on power to check Ready Lamp.

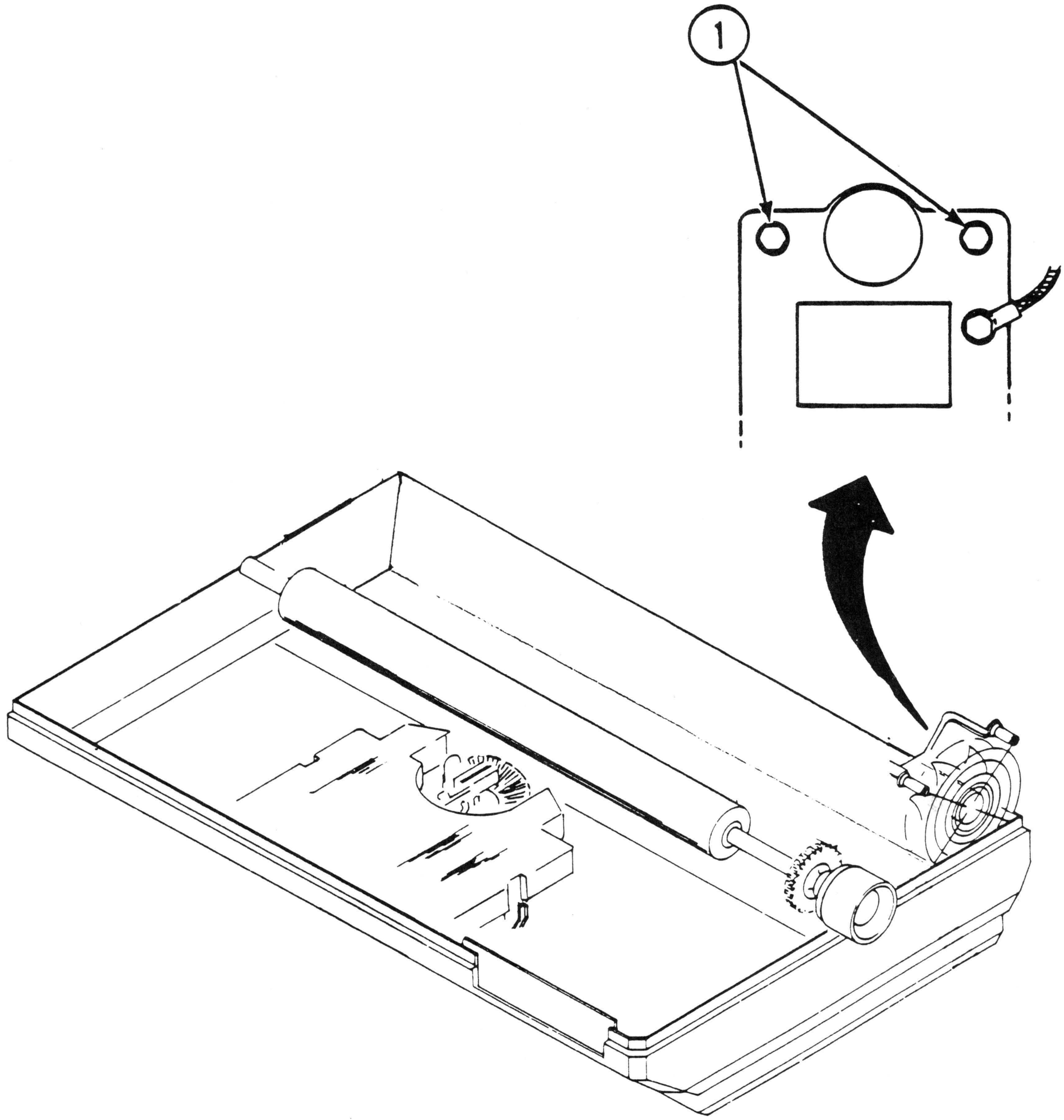


FIGURE 3

B. **REMOVE AND REPLACE POWER SUPPLY SWITCH**

The power supply switch is fairly easy to replace, but in order to access it, you need to remove the fan. It is easiest to remove the fan if you first remove the main PCB.

To Remove:

1. Disconnect AC power cord.
2. Remove main PCB.
3. Using a 1/4 inch nut driver and a 1/4 inch wrench, remove the two screws that hold the fan to its mounting bracket (see Figure 3, #1).
4. Carefully lift fan out of printer as far as its wires permit, keeping hold of both the front and back of the fan. Then return the screws to the fan to prevent it from coming apart.
5. Mark or note the position of the four wires to the power switch; then disconnect the spade connectors from the power switch. You may need to use long nose pliers to remove the spade connectors.
6. Depress the spring lever (cut the tie wrap if present) at the top of the power switch and push the switch out of the printer.

To Replace:

1. Replace switch and reconnect wires.
2. Install fan.
3. Return main PCB to ready position and reconnect cables.
4. Defeat top cover interlock switch.
5. Reconnect power cord.
6. Turn on power and check ready light. If it lights, you have successfully replaced the switch.

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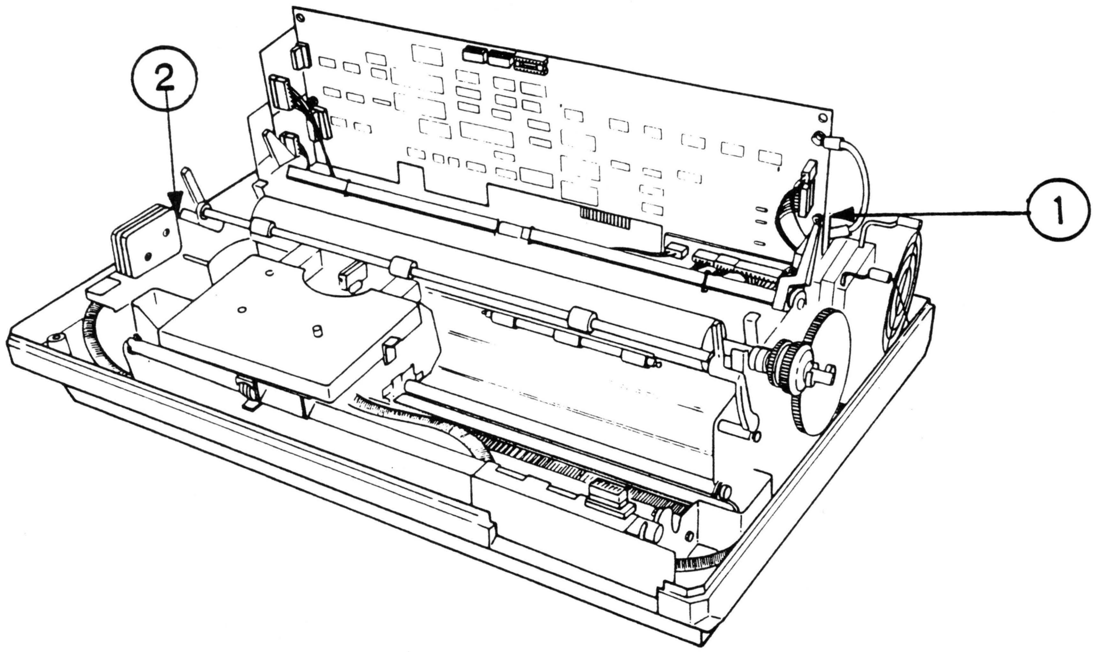


FIGURE 4

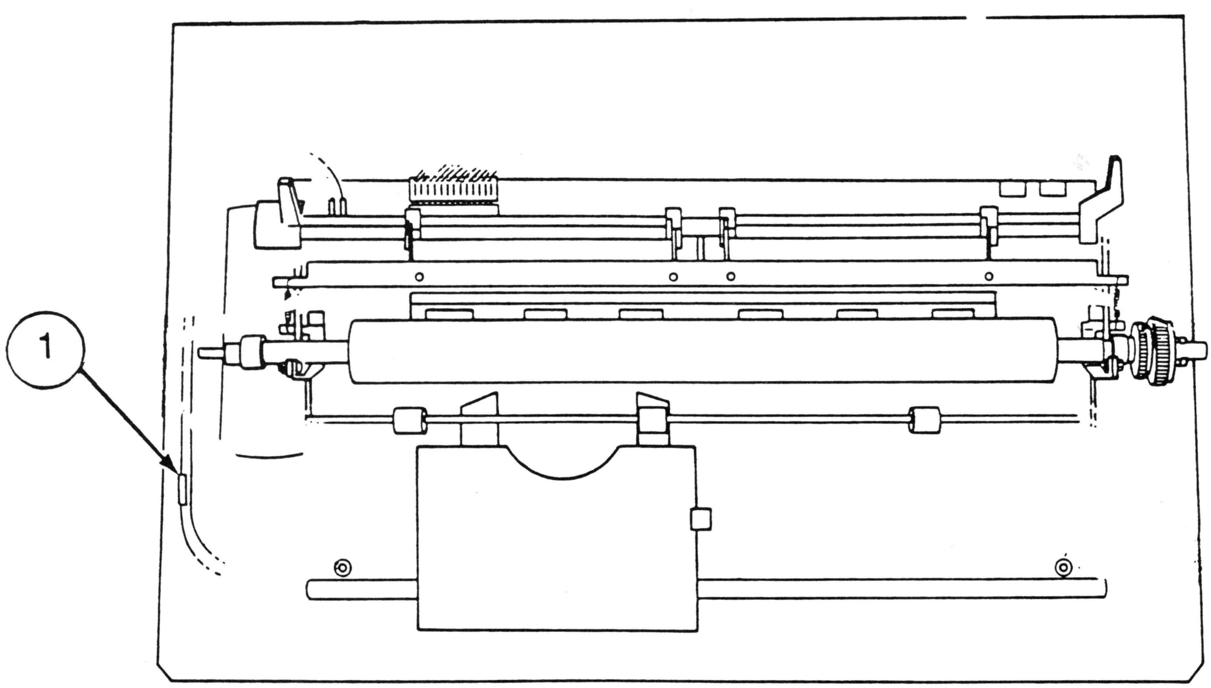


FIGURE 5

C. REMOVE AND REPLACE MECHANICAL ASSEMBLY

You must remove the mechanical assembly to gain access to the power supply PCB, the carriage drive motor, and other parts of the printer assembly.

To Remove:

1. Remove the main PCB (see above, p.2.3).

2. Disconnect the ground wires from the back plate of the case (see Figure 4, #1).

3. Remove the four retaining screws on the underside of the printer.

4. Remove the two spade connectors from the cover interlock switch (Figure 4, #2), using needlenose pliers or a flat blade screwdriver.

5. Release harness assembly from clamp near left side-frame. (See Figure 5, #1.)

6. Unplug the harness cable connector from its mate on the right front side of the assembly.

7. Lift mechanical assembly from frame.

To Replace:

1. Push loose cables along the right side of the case out of the way, and then slowly lower mechanical assembly onto frame.

2. Reconnect the two spade connectors to the cover interlock switch (Figure 4, #1). Remember that the upper pole of the switch is not used; they attach to the lower two poles.

3. Reconnect the right side of the harness cable to its mate. Make sure the two sides are correctly aligned.

4. Replace harness cable in clamp near left side of frame (see Figure 5, #1).

5. Reconnect ground wire to back of case.

6. Return and tighten four retaining screws on underside of printer.

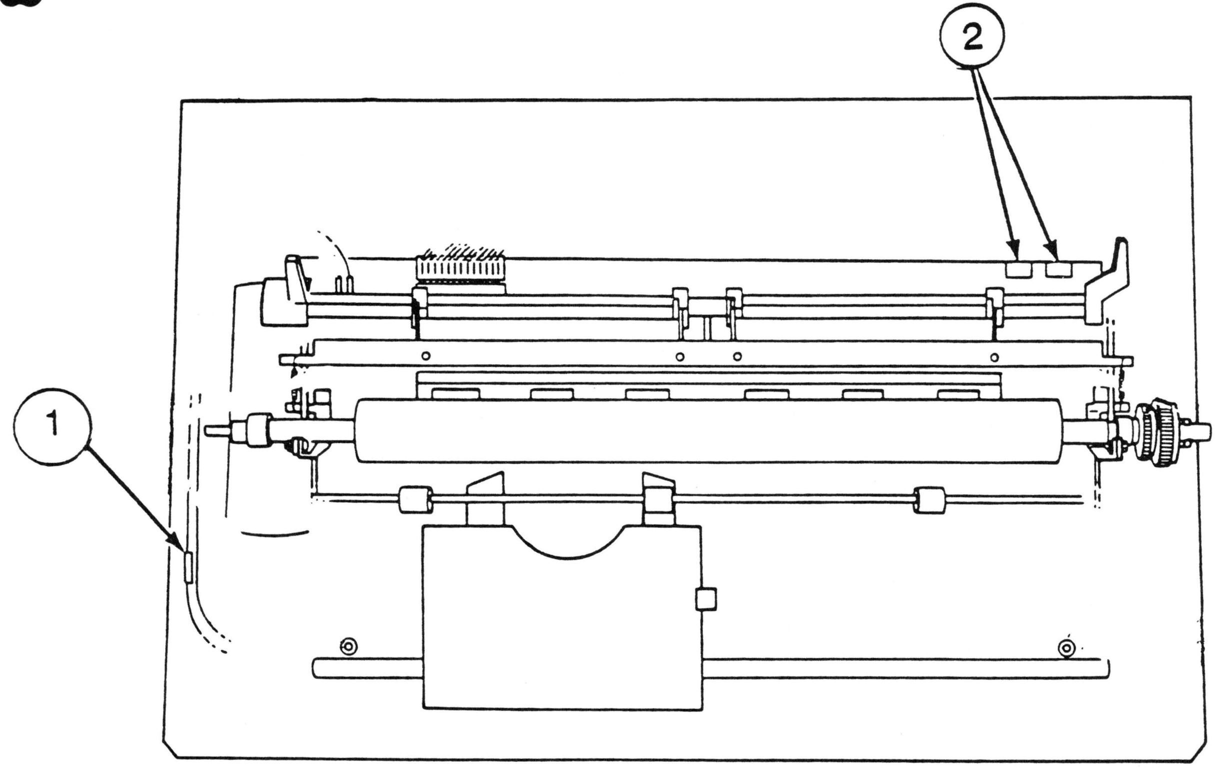


FIGURE 6

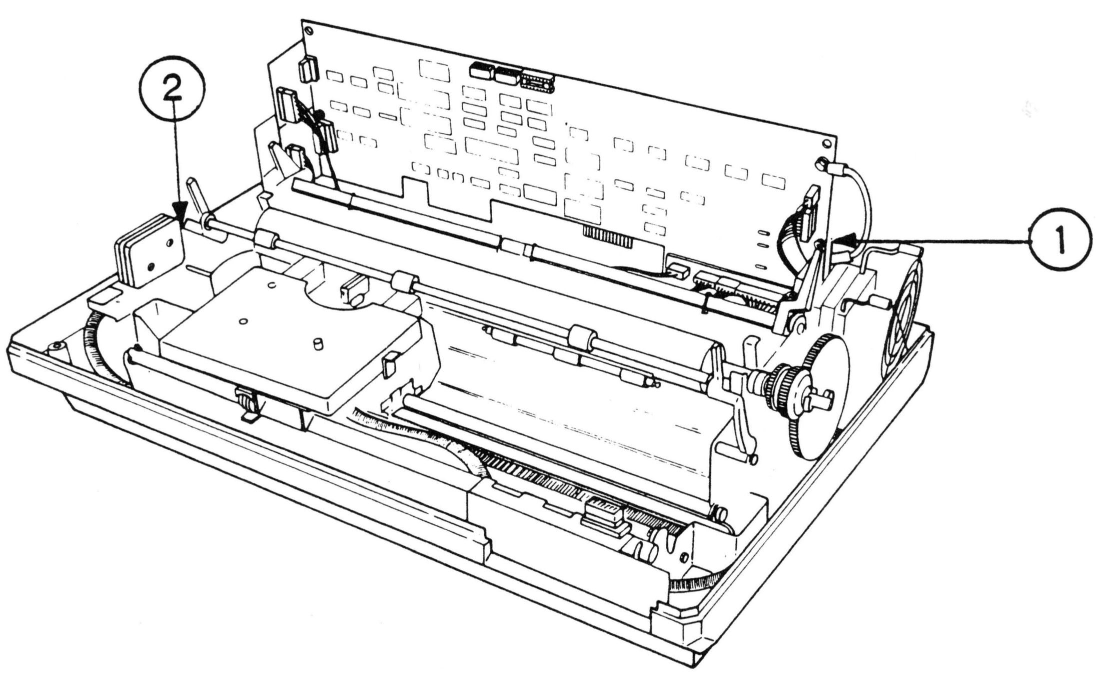


FIGURE 7

D. REMOVE AND REPLACE POWER SUPPLY PCB:

CAUTION: MAKE SURE THE AC POWER CORD IS NOT CONNECTED BEFORE TOUCHING THE POWER SUPPLY PCB. LETHAL VOLTAGE IS PRESENT WHEN THE AC POWER CORD IS CONNECTED.

To Remove:

1. Remove main PCB and mechanical assembly.

2. Disconnect P-1 and P-2 from the right side of the power supply PCB (see Figure 6, #2).

3. There are five white plastic peg fasteners holding the board. Use a small screwdriver, long nose pliers, or your finger to depress the lip of the fastener, then lift the board slightly off the fastener. Repeat until all five are free.

4. Lift power supply PCB from frame.

To Replace:

1. Install power supply PCB on fasteners. Push down to lock.

2. Attach connectors P-1 and P-2 (on right side of power supply PCB) (see Figure 6, #2)

3. Push loose cables along the right side of the case out of the way, and then slowly lower mechanical assembly onto frame.

4. Reconnect the two spade connectors to the cover interlock switch (Figure 7, #2). Remember that the upper pole of the switch is not used; they attach to the lower two poles.

5. Reconnect the right side of the harness cable to its mate. Make sure the two sides are correctly aligned.

6. Replace harness cable in clamp near left side of frame (see Figure 6, #1).

7. Reconnect ground wire to back of case (Figure 7, #1).

8. Return and tighten four retaining screws on underside of printer.

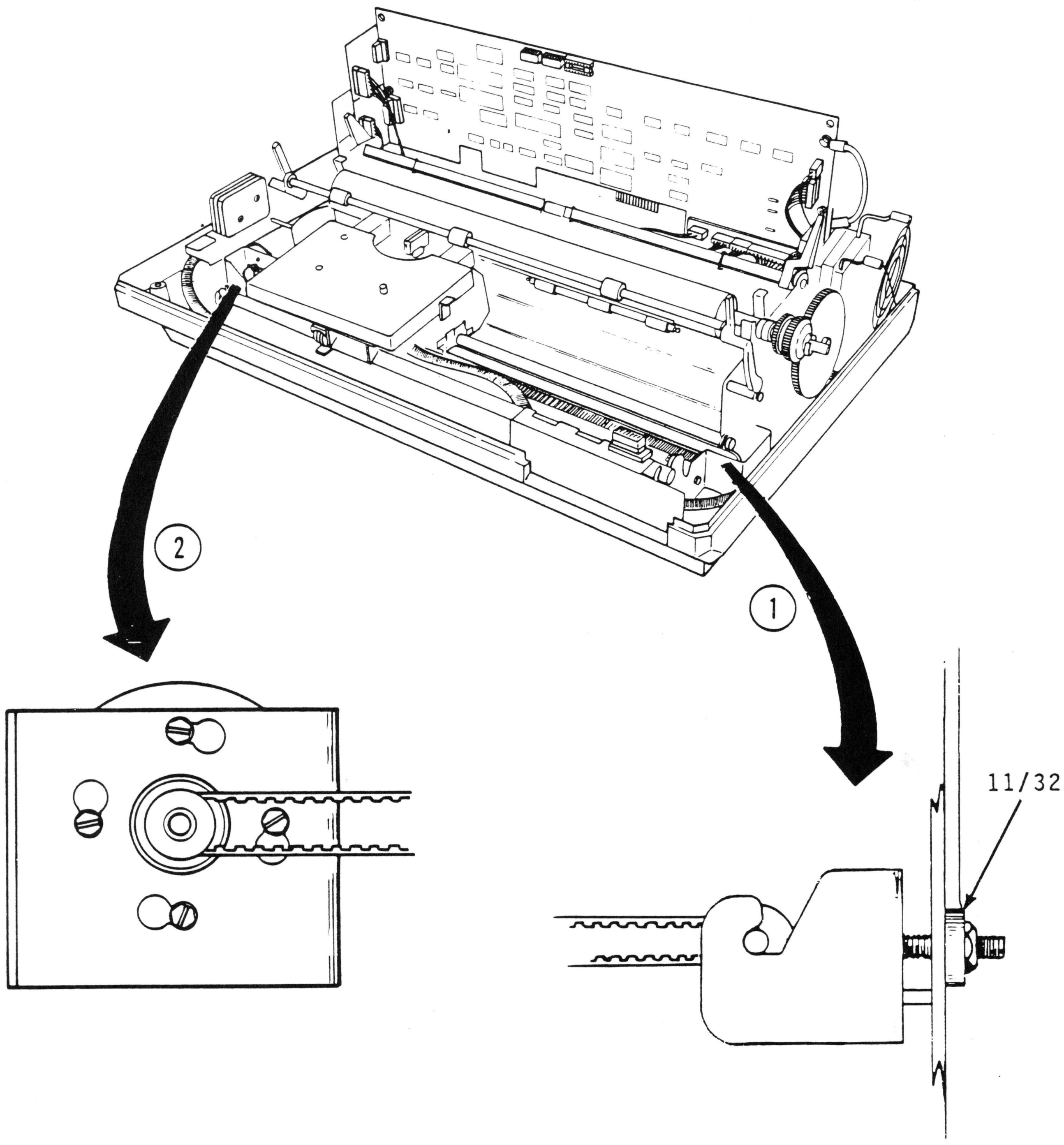


FIGURE 8

E. REMOVE AND REPLACE CARRIAGE DRIVE MOTOR

Whenever you remove and replace the carriage motor, you will have to adjust the drive belt tension (section 3H, p. 3.19 below). Note also that the carriage motor and its encoder PCB are replaced as a unit, because the resistance on each encoder PCB is matched to a particular motor at the factory.

To Remove:

1. Disconnect AC power cord.

2. Remove top cover.

3. Remove the mechanical assembly from the printer and place it on a stable work surface.

4. Use an 11/32 inch open end wrench to loosen the drive belt adjusting nut (on the right side - see Figure 8, #1) to relieve tension from the drive belt. (Do not remove nut from screw.)

5. Move the carriage all the way to the right and pry the edge of the belt free from the left-side pulley; then slowly slide the carriage left to ease the belt off the pulley completely.

6. Use a screwdriver and/or a 1/4 inch wrench to remove the four mounting screws holding the carriage drive motor (see Figure 8, #2). Note the ground wire connector under the top screw - you will replace it later.

7. Detach the two spade connectors from the brush mountings on the motor.

8. On some models, the motor cable is held to the mechanical assembly with a clamp. If yours has this feature, unhook the cable from the clamp.

9. Remove the carriage drive motor and its encoder PCB.

   NOTE: The carriage motor and encoder PCB are always replaced as a unit. Each encoder PCB is matched to a particular motor by the factory.

To Replace:

1. Place carriage drive motor on mechanical assembly and attach the two spade connectors (black wire to black connector and red to red).

2. Place the motor against the bracket and tighten the four mounting screws with flat blade screwdriver or 1/4" wrench. Remember to reinsert the ground wire connector under the top screw.

3. If the motor cable was clamped to the mechanical assembly, replace it in its clamp.

4. Move the carriage assembly to the left and slip the drive belt over the motor pulley (left side pulley). Use your left thumb to get a piece of the belt on the bottom of the pulley. Then move the carriage assembly slowly right to ease the belt completely onto the pulley.

5. Place the mechanical assembly in the printer and reconnect all cables. Make sure the cables on the right are in the holders along the side of the frame.

6. Replace the four mechanical assembly retaining screws.

7. Connect carriage motor encoder PCB to the main PCB.

8. Tighten the drive belt adjusting nut on the right side of the frame and adjust the drive belt tension (see section 3H, p. 3.19 below).

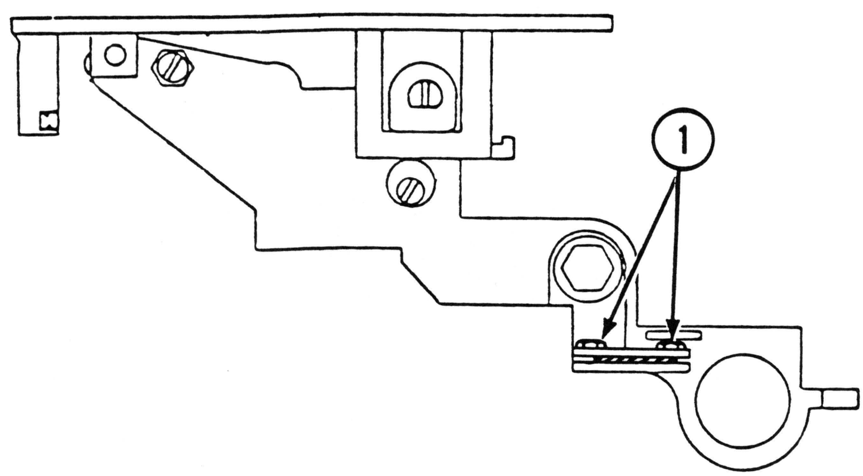


FIGURE 9

RIGHT SIDE - VIEW OF CARRIAGE ASSEMBLY

F. REMOVE AND REPLACE CARRIAGE ASSEMBLY

The carriage assembly is one of the more complicated removal and replacement tasks. The basic components of the carriage assembly are the ribbon support plate, ribbon motor, printwheel motor, and print hammer assembly. The print hammer can be replaced by itself (see below, p.2.21). If any of the other parts is faulty, you need to replace the entire carriage assembly.

To Remove:

1. Disconnect AC power cord. Remove the four mechanical assembly retaining screws from the bottom of the case, but leave the mechanical aseembly in the case.

2. Remove ribbon, printwheel and platen. Leave printwheel motor assembly tilted away from platen cradle.

3. Note position and routing of carriage harness cable. Mark the position of the three carriage harness clamps (left, right and center of structure assembly) on the cable. Loosen the clamps enough to free the cable.

4. Unplug the right side of the harness cable from its connector at the right front corner of the mechanical assembly.

5. Raise main PCB to service position.

6. Unplug the bottom encoder PCB from the main PCB.

   Note: The encoder PCB is an integral part of the carriage assembly, so replacement of the carriage assembly must include the new encoder PCB supplied with it.

7. With flat blade screwdriver, loosen the two screws retaining the ribbon shield to the carriage assembly and remove the ribbon shield.

8. Loosen the drive belt adjusting nut (on the right side) to relieve tension. Use an 11/32 inch open end wrench.

9. With a 3/16 inch wrench or a flat blade screwdriver, loosen the two screws holding the drive belt to the right side of the carriage assembly (see Figure 9, #1). Pull the belt out of the bracket. (Don't remove the left side yet: that will be easier later (step 14).)

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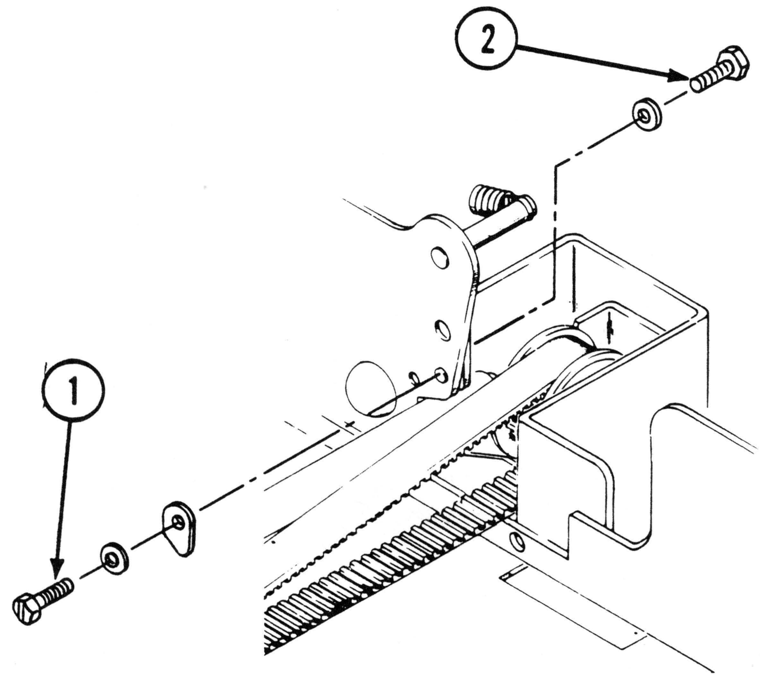


FIGURE 10

10. Use either a screwdriver or a 1/4 inch wrench to loosen the two locking plate screws (one on each side of the frame) that hold the rear guide shaft (see Figure 10, #1).

11. Use a 1/4 inch wrench to remove the outer screw on the right side of the frame (see Figure 10, #2).

12. Slide the carriage assembly as far left as possible. Push the right hand drive pulley out of the way and lift the right side of the rear shaft free of its mounting slot. Then pull the shaft to free the left side from its mounting hole.

13. Lift the rear shaft up and pull the carriage assembly off the grooved front bearing on the front guide rail shaft.

14. With flat blade screwdriver, loosen the two screws holding the drive belt to the left side of the carriage assembly and free the belt.

15. Slide the rear guide shaft out of the carriage assembly.

16. Release the harness cable from the clamp on the left side of the printer case.

17. Detach the harness cable connector from the encoder PCB and pull the harness cable through the slot in the mechanical assembly.

18. Remove the carriage assembly from the printer.

To Replace:

1. Slide the rear guide shaft onto the carriage assembly.

2. Fit the carriage assembly onto the grooved front bearing.

3. Slide the carriage as far left as possible. Return the shaft to the left side hole. Then push the right side of the shaft into its slot.

4. Replace the outer screw in the hole. (It is probably easiest to start it with your fingers and then tighten it with the wrench.)

5. Replace the two rear shaft locking plates, making sure they butt against the shaft; then tighten the screws.

6. Route the drive belt over the carriage motor pulley (left side), insert it into the left side of the carriage assembly, and tighten the two belt cleat screws.

CONTINUED ON NEXT PAGE.

7. Do the same on the right side; hold the right side pulley in place as you tighten the two belt cleat screws for the right side.

8. Tighten the drive belt adjusting nut.

9. Route the carriage harness assembly as you noted earlier and replace the clamps.

10. Run the carriage assembly back and forth to check for free run and non-interference with the harness cable.

11. Reconnect the right side of the harness cable to its mate.

12. Plug the connector from the harness cable into the encoder PCB, plug the encoder PCB into the main PCB, and slip the harness cable into its clamp on the left side of the frame.

13. Replace the ribbon shield (it slides in from the side) and start screws.

14. Lift the platen cradle out of the way. Adjust the ribbon shield so that the distance between the front of the ribbon support plate and the ribbon shield is 4.0 inches (see Figure 11; see also ribbon shield adjustment, p. 3.21 below). Tighten screws.

15. Replace cradle, platen, printwheel and ribbon.

16. Adjust the drive belt tension as you learned earlier.

17. Replace the four mechanical assembly screws on the bottom of the printer.

18. Defeat the cover interlock and perform the Terminal Self-Test.

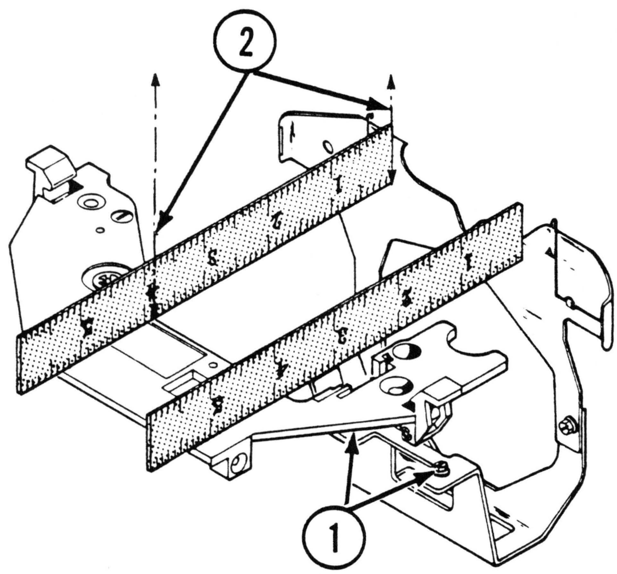


FIGURE 11

G. REMOVE/REPLACE PRINT HAMMER

The print hammer sometimes, though rarely, needs replacement. When you remove it, be careful of the spring inside the assembly. If you slide the hammer from the assembly, you must hold onto the spring; otherwise it pops out of its place and is easily lost.

To Remove:

1. Remove the two print hammer adjustment screws (see Figure 12, #1) with either a flat blade screw driver or a 3/16 inch box wrench. The nut plate for the two screws will come loose as the screws are removed (see Figure 12, #2). Hold the print hammer between your thumb and index finger as you remove the screws (see Figure 12, #3). To avoid losing the spring within the assembly, do not slide the hammer out of the assembly.

To Replace:

1. Grasp the print hammer between your thumb and index finger. Hold the assembly in place and insert the two adjustment screws.

2. Release the print hammer and put the nut plate in position (curved side of plate away from print hammer assembly).

3. With flat blade screwdriver, tighten the screws.

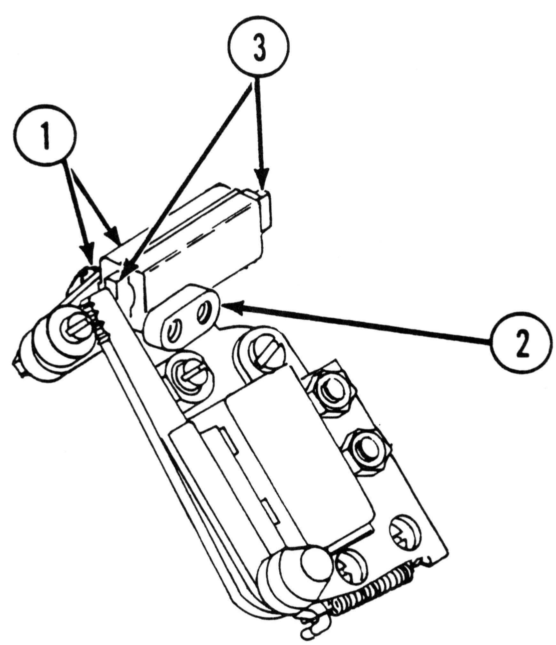


FIGURE 12

apple computer inc.

Apple Daisy Wheel Printer
Technical Procedures

Section 3

Adjustments

Contents:

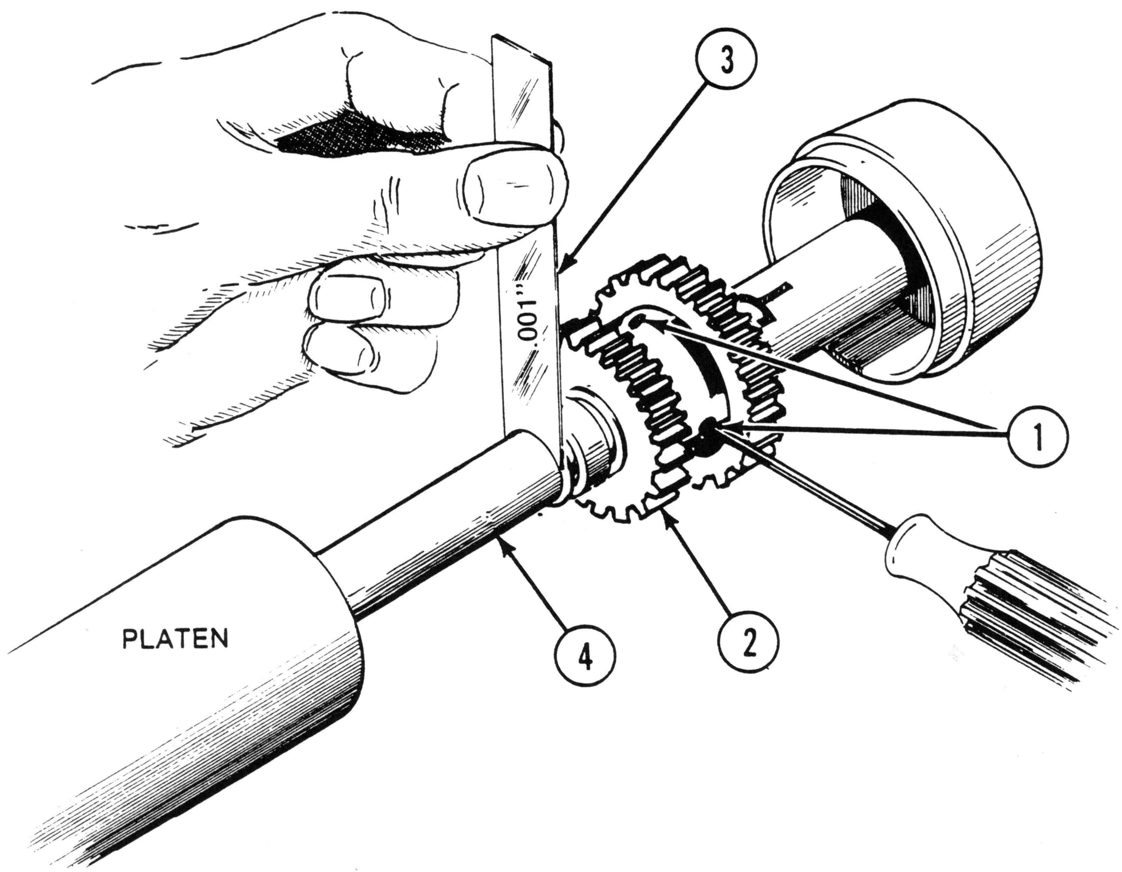


FIGURE 1

A. ADJUSTING THE PLATEN LOCATOR SLEEVE

The platen locator sleeve is on the right side of the platen, near the tractor gear (see Figure 1). There should always be a small amount of end play for the platen locator sleeve to prevent binding. If there is too little play, the platen will not turn, or line feeding will be irregular. If there is too much play, the horizontal registration of the print will shift from line to line, so that it won't "line up" vertically. To check the end play, use a feeler gauge; 0.001 inches to 0.003 inches tolerance is acceptable. If the sleeve is misadjusted, follow the steps below to adjust it.

1. Disconnect power cord and remove top covers.

2. Pull paper bail forward (away from platen).

3. Remove platen by placing one hand on each end, pushing down on platen release levers (one on each side) with your thumbs, and lifting platen free.

4. Use a 0.072-inch six-flute spline wrench to loosen the two collar set screws between the platen gears (see Figure 1, #1).

5. Insert 0.001 inch feeler gauge (see Figure 1, #3).

6. Push tractor gear to left, flush to gauge.

7. Tighten collar set screw with spline wrench.

8. Remove feeler gauge and twirl platen sleeve (see Figure 1, #4). If sleeve binds, loosen collar set screws and repeat adjustment, but snug gear less tightly to gauge.

9. When 0.001 feeler gauge fits without sleeve bind, test the gap with a 0.004 inch gauge. If the larger gauge fits, the gap is too large; readjust so the 0.004 gauge will not fit, but the 0.001 gauge will fit without binding.

10. Return the platen and platen knob.

11. Defeat top cover interlock switch.

12. Reconnect power cord. Load paper and run Terminal Self-Test as a final check. Make sure the spacing between lines is even: if not, loosen the sleeve. Also check the columns of H, I, 1, and | characters to make sure that the horizontal registration is steady: if not, the sleeve may be too loose.

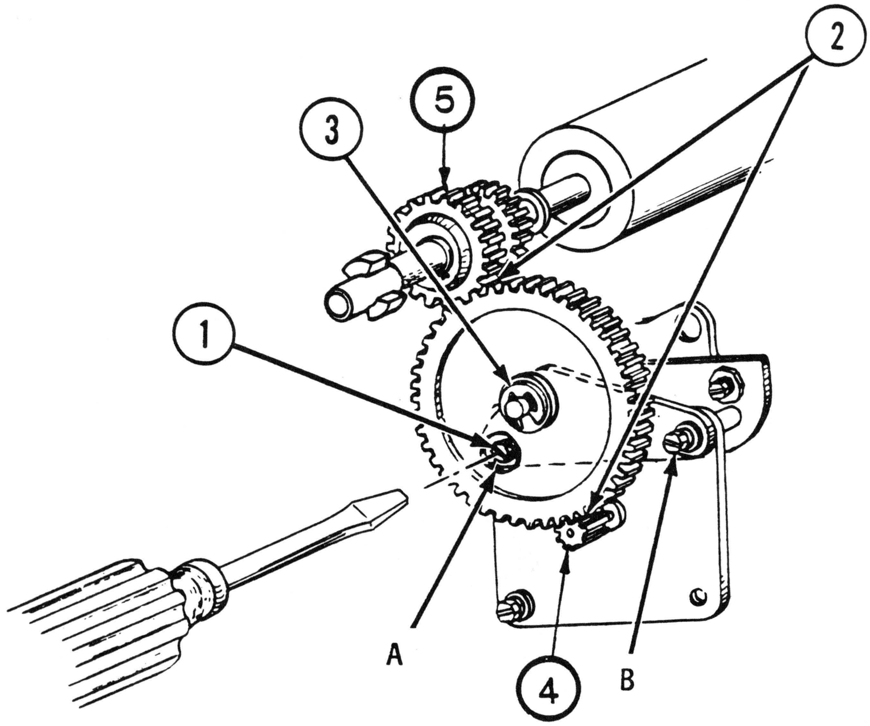


FIGURE 2

B. ADJUSTING THE PAPER FEED IDLER GEAR

The idler gear (Figure 2, large gear) transmits the rotation of the paper feed motor gear (Figure 2, #4) to the platen drive gear (Figure 2, #5). The three gears must mesh properly to prevent binding or backlash (particularly when paper feeds both forward and reverse, as in plotting graphs).

1. Disconnect AC power cord and remove top covers.

2. Pull paper bail forward (away from platen).

3. Turn platen knob to rotate idler gear so that screw "A" is visible through hole in gear (see Figure 2, #1).

4. With flat blade screwdriver, loosen the idler gear screws ("A" and "B" in Figure 2). Push the idler gear so that its teeth "bottom" in both the paper feed motor gear and the platen drive gear (see Figure 2, #2).

5. Tighten screws "A" and "B".

6. To check for the "no bind" condition, remove the idler gear E-ring retainer (see Figure 2, #3); push it off with a screwdriver. Slide the idler gear back and forth on its mounting stud. If you cannot move the idler gear, or if it binds on either of the other two gears, repeat steps 1 and 2 to readjust it. When idler gear slides freely, reinstall the E-ring.

7. To check for the "no backlash" condition, hold the idler gear and rotate the platen knob back and forth about a quarter turn. There should be no appreciable free play between the teeth of the idler gear and either the tractor gear or the paper feed gear as the teeth mesh (see Figure 2, #2).

8. Defeat the top cover interlock.

9. Reconnect AC power cord.

10. Run Terminal Self-Test as a final check. If line feeding is regular, the idler gear is correctly adjusted.

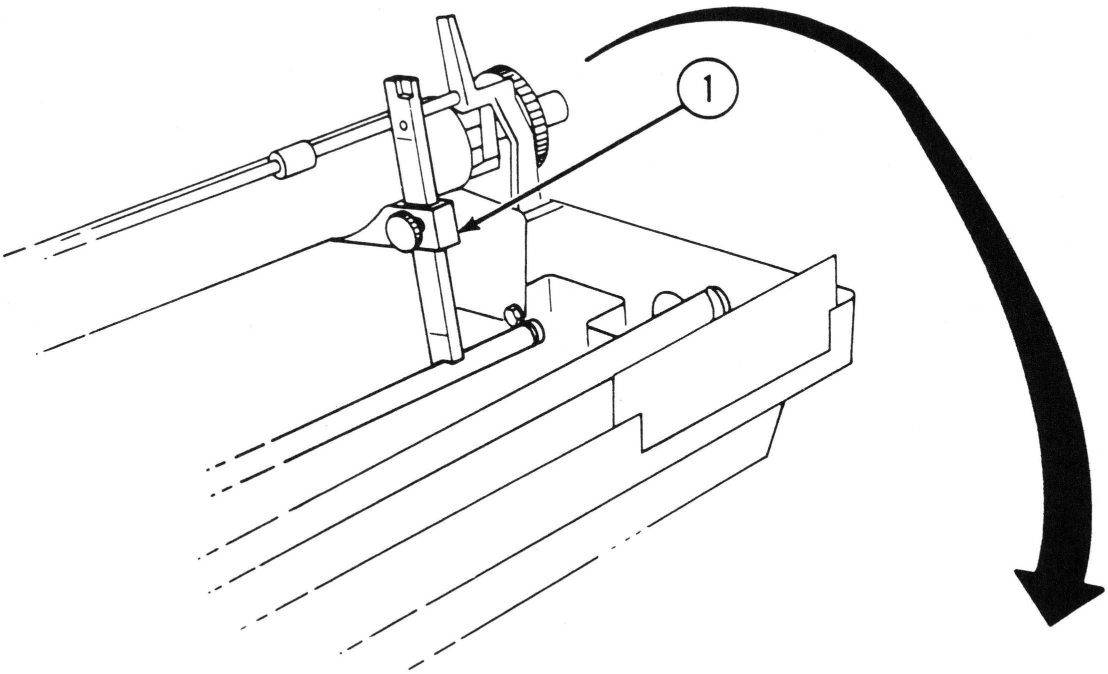


FIGURE 3

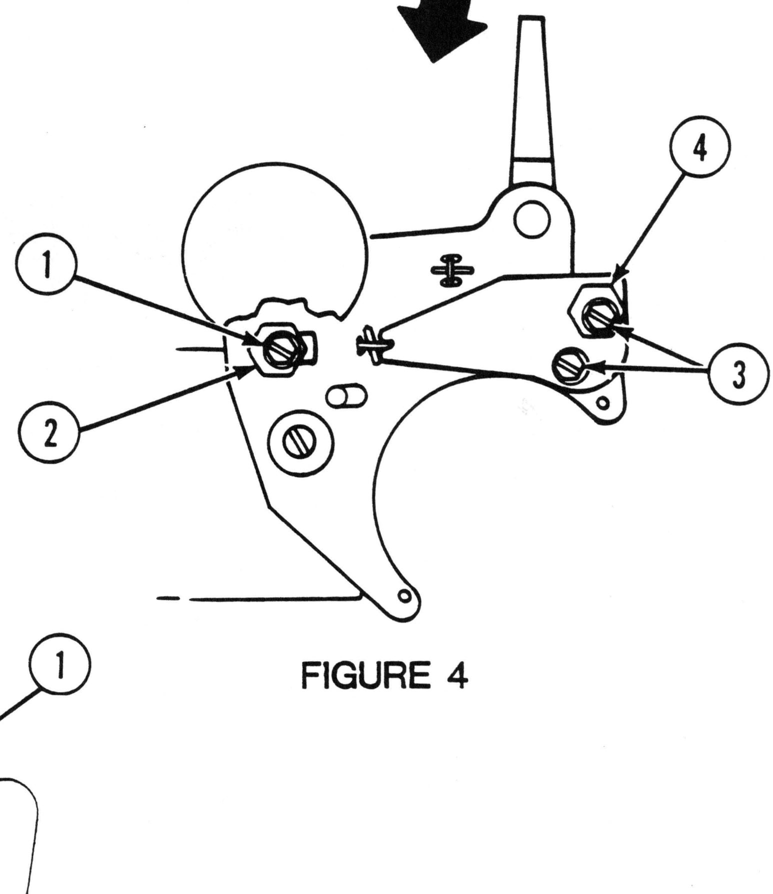


FIGURE 4

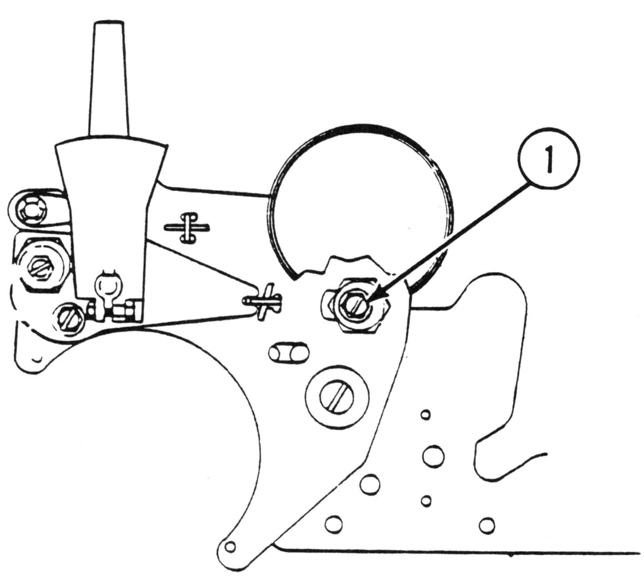


FIGURE 5

C. ADJUSTING PLATEN HEIGHT AND DEPTH

The platen height and depth adjustments directly affect print quality. If the platen is too high, the bottoms of letters will not print; if it is too low, the tops will be missing. If the platen depth is not even at all points, the print quality will be uneven from side to side of the page.

The platen height and depth should be also be checked and (if necessary) adjusted before you adjust the ribbon support plate.

Height:

1. Disconnect AC power cord.

2. Remove the top cover.

3. Remove the E-clip and the idler gear.

4. Move Multicopy Select lever (left side, behind platen) to full forward position.

5. Move the carriage assembly to the center of the printer.

6. Set combo gauge slide to the #2 position and place it between the carriage assembly rear shaft and the platen near the right side. (See Figure 3, #1.)

7. Loosen the lock screw (Figure 4, #1) just enough to allow rotation of the 5/8 inch eccentric nut (Figure 4, #2). Rotate the eccentric (with 5/8 inch wrench or duck-bill pliers) until the surface of the platen just touches the combo gauge slide. Then tighten the lock screw.

8. Repeat steps 6-7 for the left side of the platen. (See Figure 5, #1.)

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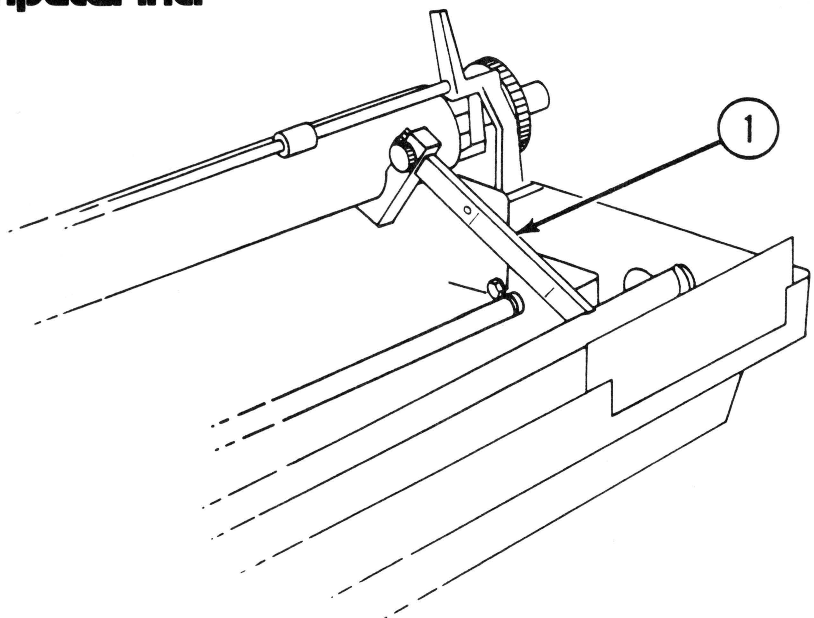


FIGURE 6

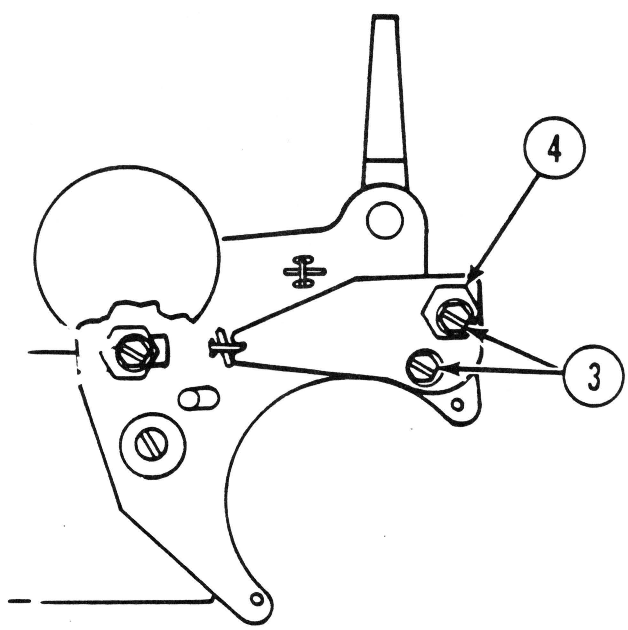


FIGURE 7

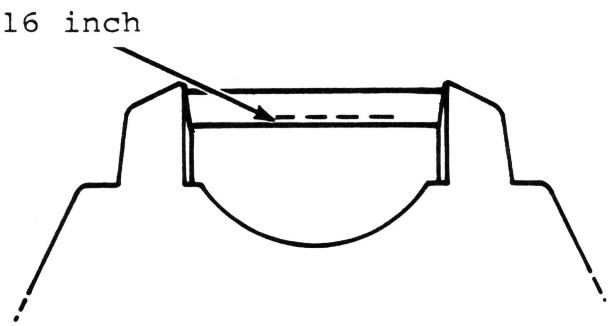


FIGURE 8

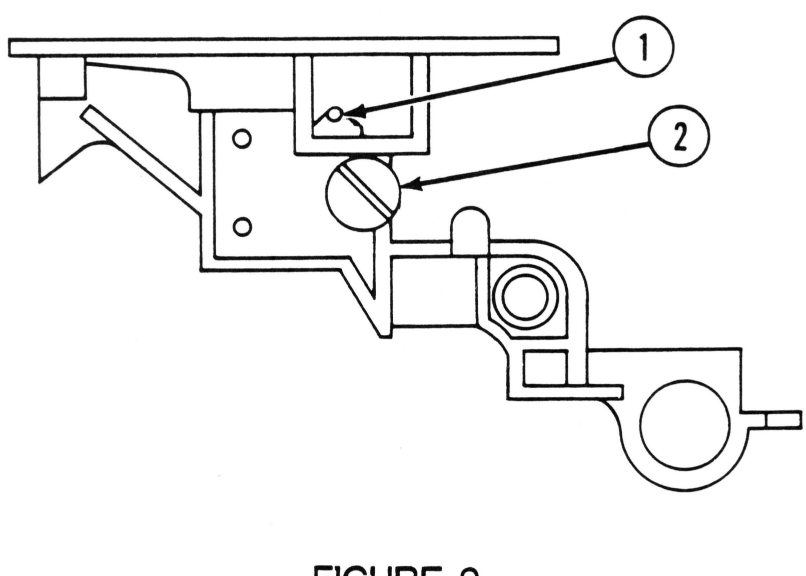


FIGURE 9

RIGHT SIDE VIEW OF CARRIAGE ASSEMBLY

D. ADJUSTING THE RIBBON SUPPORT PLATE

If the printwheel is hitting the ribbon at too high or too low a position, some letters may get insufficient inking at top or bottom. To correct this, the ribbon support plate can be adjusted. This is the only situation in which you would adjust the ribbon support plate.

To Check Adjustment:

1. Perform a Terminal Self-Test, stopping the test as soon as possible after the underscore (_) is printed. (It will be near the center of the print line, so try stopping at about the center).

2. Remove the ribbon cartridge and find where the underscore struck on the ribbon. It should be about 1/16 inch from the bottom of the ribbon (see Figure 8). If it is higher or lower than that, the ribbon support plate needs adjustment. (For the purposes of this module, perform the adjustment even if it is not needed.)

To Adjust:

1. Disconnect the AC power cord.

2. Loosen the nut on the back of the up-stop with a 1/4 inch wrench. Rotate the up-stop to its highest position. (See Figure 9, #1.)

3. Use a flat blade screwdriver in the eccentric (Figure 9, #2) to raise or lower the support plate. If the print is too high on the ribbon, the ribbon is too low, so raise the support plate. If print is too low on ribbon, lower the support plate.

5. When the support plate is properly adjusted, lower the up-stop so that it touches the support plate, and tighten the nut.

6. Reinstall the ribbon cartridge and repeat steps 1 & 2. Readjust the support plate as necessary.

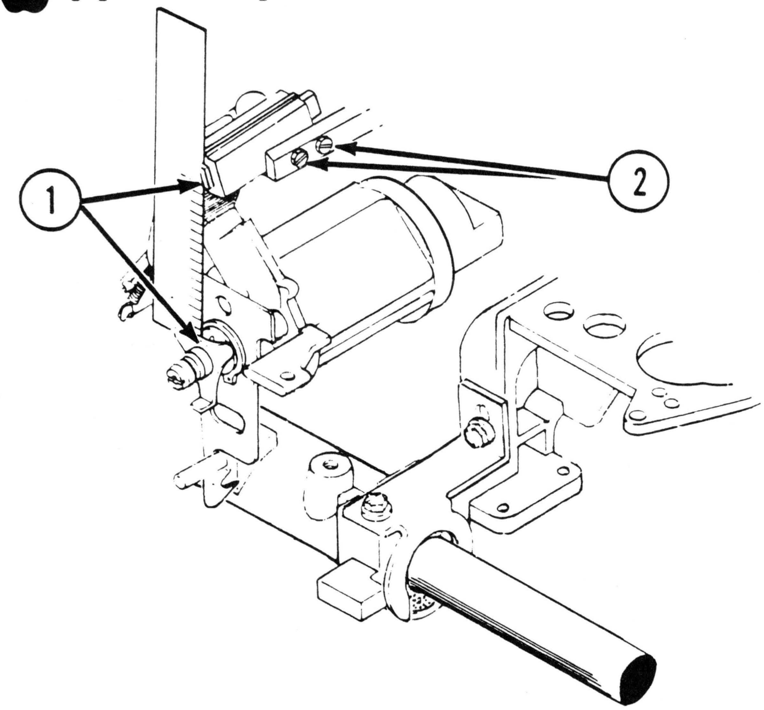


FIGURE 10

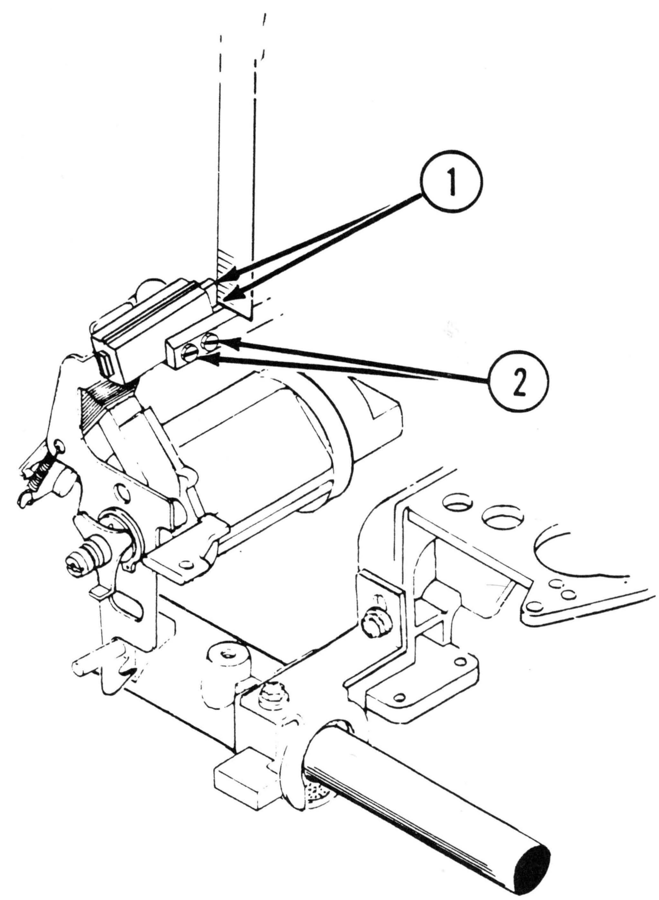


FIGURE 11

E. ADJUSTING PRINT HAMMER HEIGHT AND ANGLE

Print quality problems that are not solved by platen height and depth adjustments can usually be resolved by adjusting the print hammer. Before adjusting it, check that the platen height and depth and ribbon support adjustments are correct. Also make sure that the print hammer is clean.

If the bottoms of characters are light, you should lower the rear of the print hammer (end farthest from the print-wheel). If tops are light, raise the rear of the print hammer. If all characters appear too light or dark, refine penetration adjustment (see below, section F).

To Adjust:

1. Disconnect AC power cord.

2. Open access panel, remove ribbon cartridge and printwheel.

3. Measure the distance between the printwheel inner hub and the bottom of the print hammer (see Figure 10, #1). This distance should be about 1 3/4 inches. To adjust, loosen the two print hammer adjusting screws with flat blade screwdriver or 3/16 inch wrench (see Figure 10, #2).

4. Next, measure the distance from the top of the casting, above the adjustment screws, to the top of the print hammer (see Figure 11, #1). This distance should be about 1/8 inch. After adjustment, tighten adjustment screws (see Figure 11, #2).

5. As both of these adjustments are fairly rough, you must refine your adjustments based on Print Quality. Perform a Terminal Self-test. If the bottoms of characters are light, lower the rear of the print hammer (end farthest from the print-wheel). If tops are light, raise the rear of the print hammer. If all characters appear too light or dark, refine penetration adjustment (see below, section F).

6. Rerun Terminal Self-Test and refine all adjustments until print quality is satisfactory.

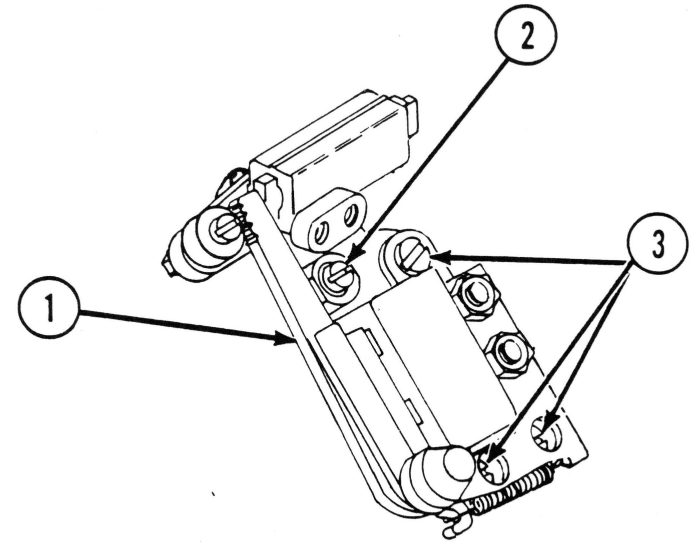


FIGURE 12

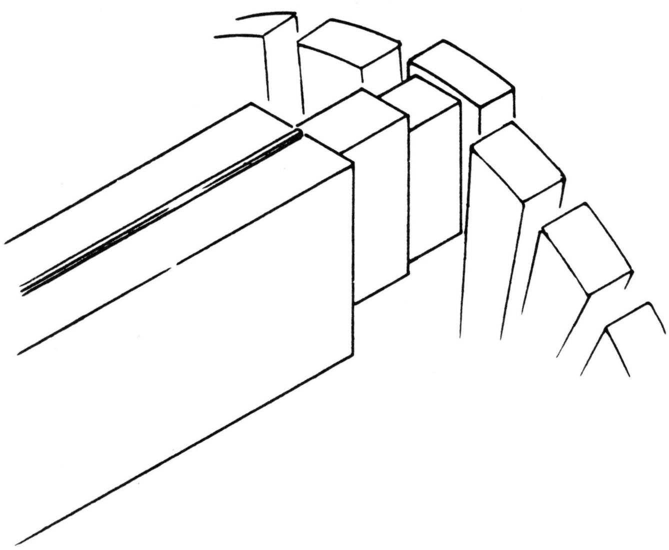


FIGURE 13

F. ADJUST PRINT HAMMER PENETRATION

The penetration adjustment is critical to print quality. If the penetration is too shallow, the print will be light; if it is too deep, it may puncture the paper and will cause excessive wear on the printwheel.

To Inspect:

1. Remove printwheel and lay it on a flat surface.

2. Inspect printwheel to see that all spokes are in the same plane and that none are bent or warped. If damaged, replace with a new printwheel.

3. Return printwheel to printer and tilt printwheel assembly towards the platen, locked in the print ready position.

4. Push the hammer armature against the coil pole pieces (see Figure 12, #1). With armature held against coil pole pieces, check that the hammer is deflecting a printwheel spoke about half the thickness of a spoke. Check this measurement at several locations around the printwheel (see Figure 13). If penetration is misadjusted, follow the steps below.

To Adjust:

1. With flat blade screwdriver, loosen the three armature penetration screws (see Figure 12, #3).

   NOTE: To reach the top screw, hold the print hammer assembly latch out of the way.

2. Move the armature assembly forward or backward to achieve the desired penetration of half the thickness of a spoke. (If adjusting forward, you may need to move the front stop out of the way first. See below, section G.) Tighten screws and recheck the adjustment.

3. When adjustment appears satisfactory, readjust the front stop (section G, below), defeat the top cover interlock switch, reconnect the AC power cord, and run terminal self-test to check print quality.

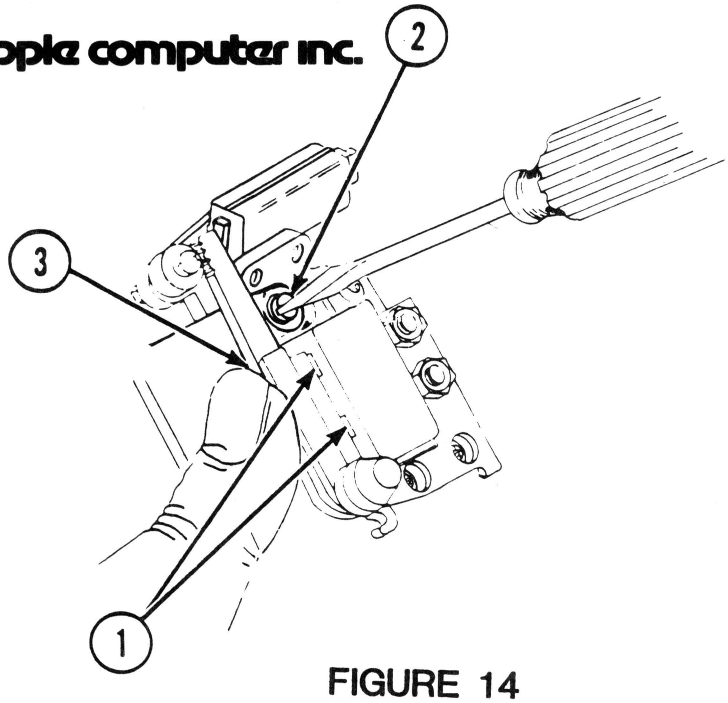


FIGURE 14

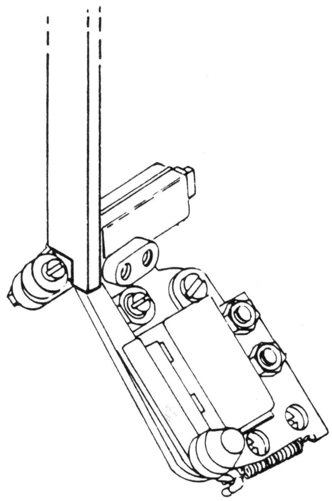


FIGURE 15

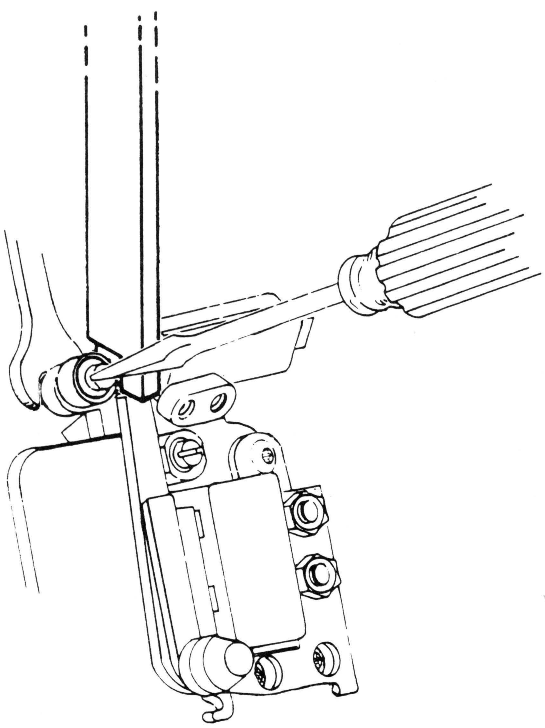


FIGURE 16

G. PRINT HAMMER ARMATURE FRONT AND REAR STOPS

Front Stop:

The hammer armature front stop (Figure 14, #2) limits wear between the armature (Figure 14, #3) and the coil pole pieces (Figure 14, #1). The adjustment is more to reduce wear than to improve print quality.

1. The front stop (Figure 14, #2) is an eccentric screw held in place by a locking nut. With a 3/16 inch wrench on the nut and a flatblade screwdriver in the eccentric, loosen the eccentric.

2. Push the hammer armature (Figure 14, #3) against the coil pole pieces (Figure 14, #1).

3. Using a flat blade screwdriver, rotate the front stop so that the hammer armature just touches the coil pole pieces and the front stop. Then tighten the nut on the front stop.

Rear Stop:

The rear stop adjustment establishes the rest position of the hammer and can affect print quality. If the hammer rests too far forward, it won't gain enough speed before it hits the printwheel, and the print will be light. If it rests too far back, it may lose force before hitting the printwheel, and again the print will be light.

1. Push the hammer armature against the coil pole pieces and hold it there.

2. Insert the slot at the #3 end of the combo gauge between rear stop and armature (see Figure 15).

3. To adjust distance, use a 3/16 inch wrench and a screwdriver to loosen the rear eccentric lock nut (see Figure 16).

4. Rotate the eccentric so the gauge fits.

5. Tighten the rear stop lock nut and remove the combo gauge.

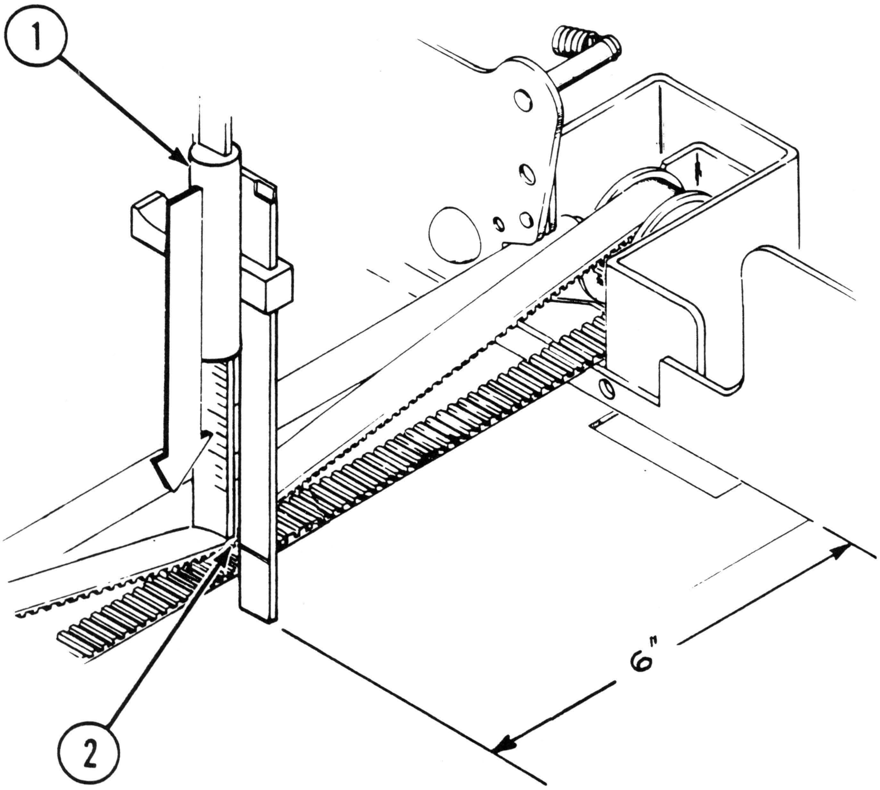


FIGURE 17

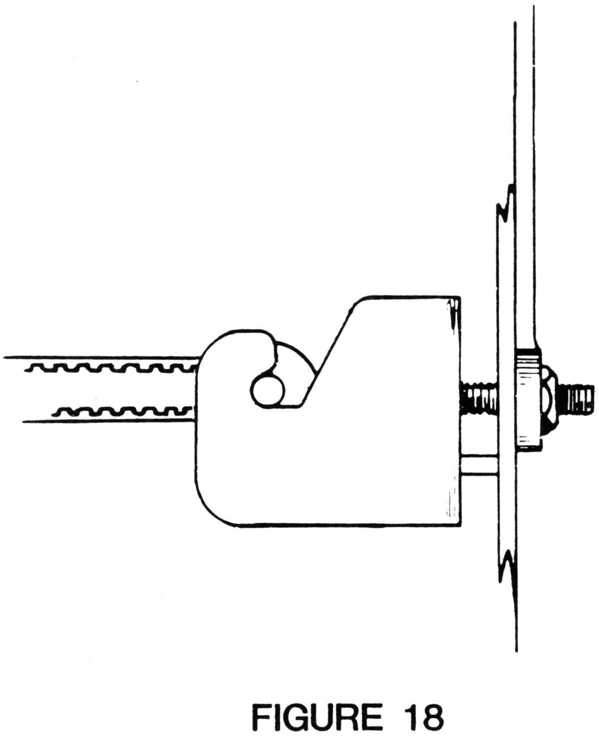


FIGURE 18

H. ADJUSTING THE DRIVE BELT TENSION

Whenever you remove the carriage assembly, you must readjust the drive belt tension. Too loose a drive belt can cause horizontal registration problems; too tight a belt can cause wear on the motor bearings.

1. Move the carriage assembly to the left side of the frame.

2. Use a pen to mark a line on the belt six inches from the right side of the frame.

3. Use a spring scale to push directly down on the drive belt with one pound of force (see Figure 17, #1). At this same point on the drive belt, use the number 1 scribe line on the combo gauge to measure the distance between the top of the drive belt (the upper section) and the printer's bottom structure. When the gauge is resting on the bottom structure, the number 1 scribe line on the gauge should be even with the top of the belt (see Figure 17, #2).

4. If the drive belt tension is not correct, turn the drive belt tension adjusting nut clockwise to increase belt tension or counterclockwise to decrease belt tension (see Figure 18).

5. After altering drive belt tension, move the carriage assembly back and forth several times; then check again for correct tension and adjust if necessary (Steps 1 through 4).

6. Defeat the top cover interlock and reconnect the power cord.

7. Run Terminal Self-Test and check horizontal registration.

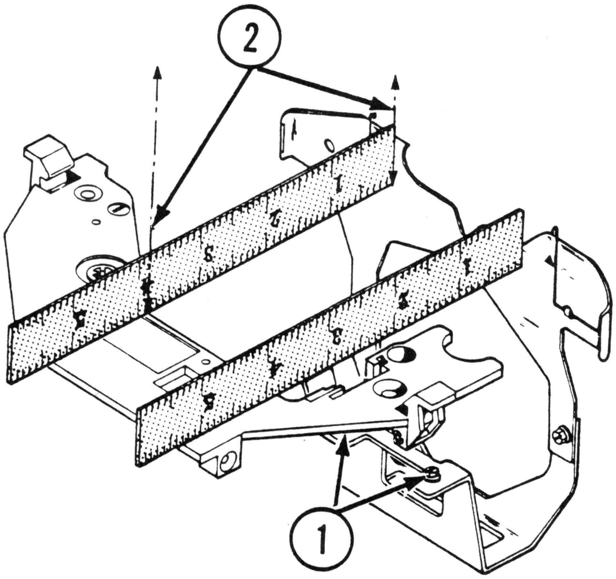


FIGURE 19

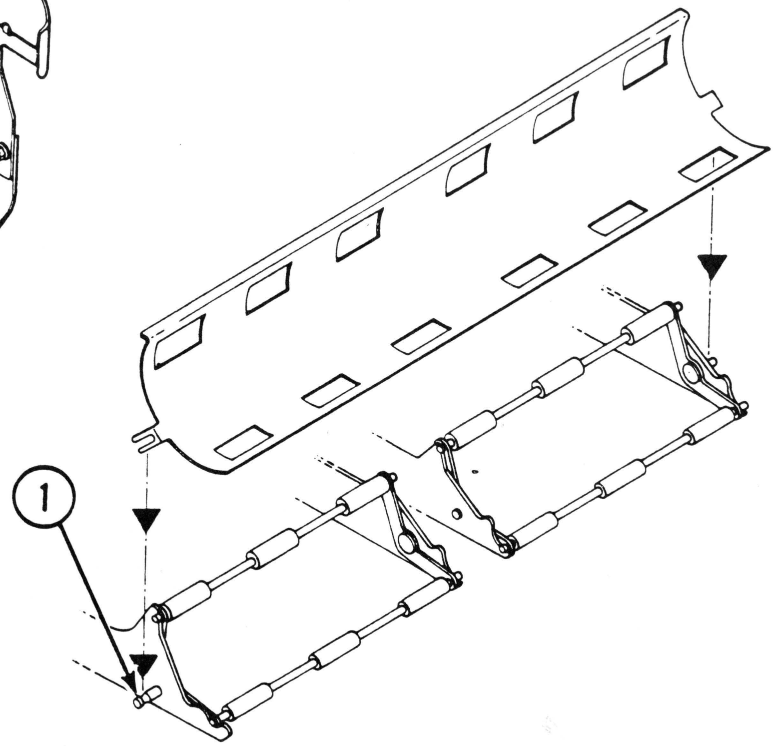


FIGURE 20

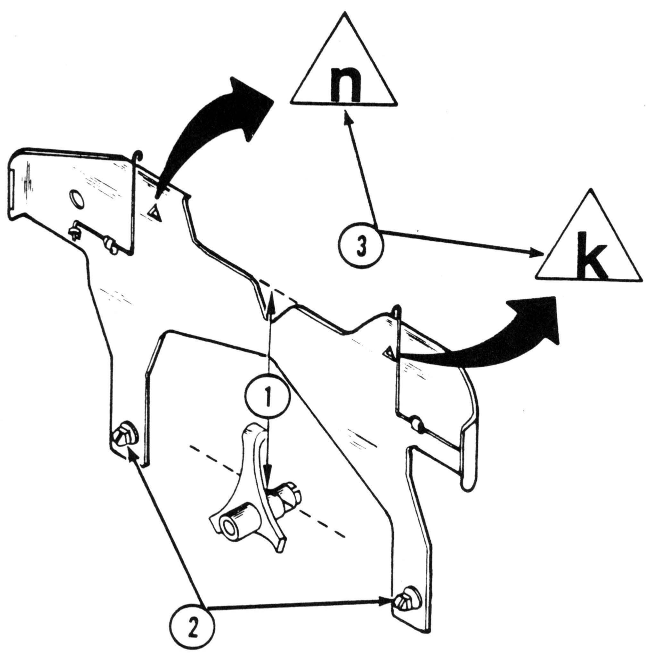


FIGURE 21

I. ADJUST RIBBON SHIELD

The metal ribbon shield provides both horizontal and vertical reference marks for text alignment. It also holds the paper against the platen. If it is too close to the platen, it may smudge the print and interfere with paper feeding; if it is too far away, or too far out of adjustment, it may cause damage to the printwheel.

1. With power off, remove the top cover.
2. Remove ribbon cartridge and printwheel and leave printwheel assembly tilted away from the cradle.
3. Move paper bail away from platen. Push down on platen release levers and remove platen.
4. Lift platen cradle away from ribbon shield and turn cradle upside down.
5. Set Multicopy Select lever (left side of printer) toward rear of printer (away from operator).
6. With flat blade screwdriver, loosen the two front-to-rear mounting screws. (See Figure 19, #1.)
7. To adjust the shield, set a 4 inch distance between the shield and the front of the ribbon support plate (see Figure 19, #2). Then tighten the front-to-rear mounting screws.
8. Lift the platen cradle back onto its retaining pins. (See Figure 20, #1.)
9. Position platen and snap it into place.
10. The horizontal distance between the ribbon shield and the front of the ribbon support plate should be about 3 7/8 inches. If necessary, loosen mounting screws and readjust to obtain this result.
11. Push the hammer assembly towards the platen and lock it in the Print Ready position.
12. Next, measure the vertical distance from the top of the printwheel hub to the top line of the ribbon shield. It should be about 1 5/8 inches. (See Figure 21, #1.)
13. To adjust, tilt the hammer assembly away from the platen and loosen the up/down mounting screws (see Figure 21, #2). When adjusted, tighten the screws temporarily. (Don't worry about perfect precision at this point; you will fine tune this adjustment in step 17.)

14. Install the printwheel and tilt the printwheel assembly back to the print position.

15. Return the ribbon cartridge.

16. Defeat the top cover interlock, turn on the printer, and perform a Terminal Self-Test.

17. Remove the ribbon cartridge and check that the bottoms of the letters appear on the baseline of the triangular reference on each side of the ribbon shield. (See Figure 21, #3.) If necessary, loosen the up/down mounting screws and readjust the ribbon shield so that the bottoms of the letters in the two reference triangles are equally level with the baseline.

18. Return the ribbon cartridge.

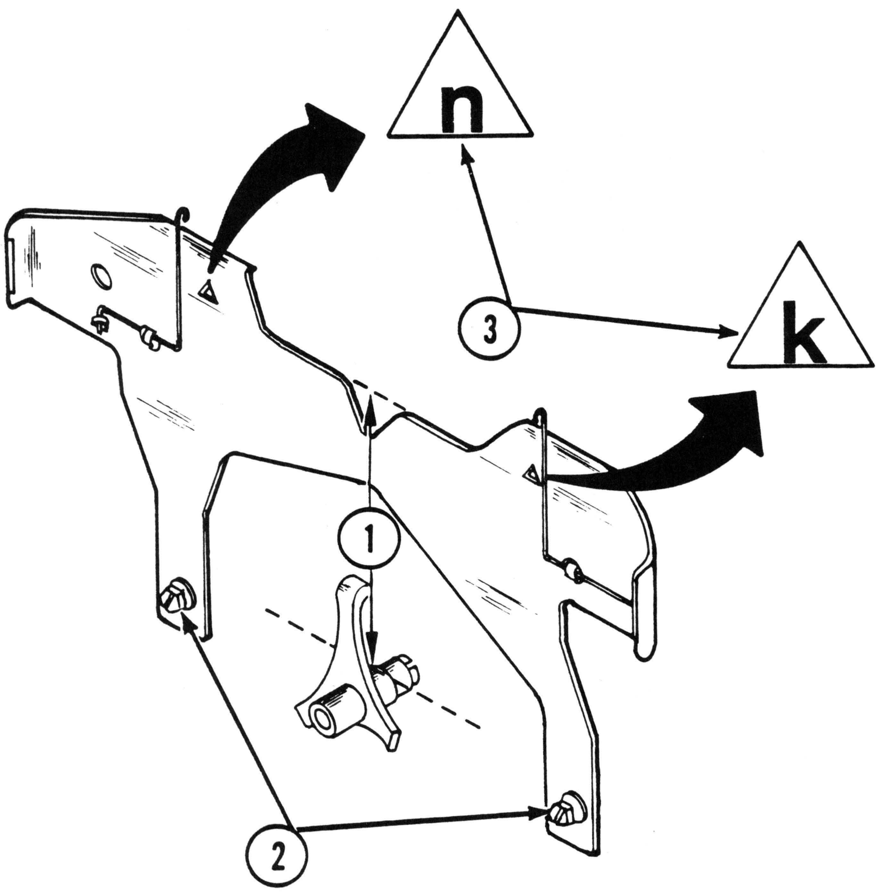


FIGURE 21

Apple Daisy Wheel Printer
Technical Procedures

Section 4

Troubleshooting

Contents:

TROUBLESHOOTING THE DWP

DWP troubleshooting consists of isolating a condition to a faulty adjustment, module or component. Your fault isolation need go no further than the level of the replaceable modules and components in your spares kit (see Table 9 for a list of Level 1 replaceable components). For example, if you narrow a problem to something within the carriage assembly, simply replace the carriage assembly and verify proper operation.

Use the Troubleshooting Table Reference (next page) to find the chart that is appropriate to the printer's symptoms. Then use that chart to determine what replacements or adjustments are needed.

TROUBLESHOOTING TABLE REFERENCE

Symptom		Table
Poor print quality		1
Will not print		
Check indicator lamps:		
READY "ON"	ATTEND "OFF"	2
READY "BLINKS"	ATTEND "ON"	3
READY "BLINKS"	ATTEND "OFF"	4
READY "OFF"	ATTEND "ON"	5
READY "OFF"	ATTEND "OFF"	6
Paper will not advance		7
Ribbon will not advance		8
Field Level Replaceable Components (Figures 1 and 2)		9

TABLE 1

PRINT QUALITY

Symptom	Adjustment
Print quality varies side to side	platen height and depth
Tops of characters lost or light (both sides of page)	platen height hammer angle (raise rear of hammer
Bottoms of characters lost or light	platen height and depth hammer angle (lower rear of hammer)
Uneven letter spacing	drive belt tension
Uneven line spacing	platen idler gear
Missing letters	hammer penetration
Light letters	hammer armature rear stop hammer penetration

NOTE: Always run a Terminal Self-Test to recheck print quality. Most adjustments will need refinement to achieve proper print quality.

TABLE 2

Symptom: Will not print

Condition: READY lamp "ON"
ATTEND lamp "OFF"

This condition shows that the printer should be ready to print.

Corrective Action: Check the following and correct if necessary, rechecking status condition:

Printwheel in place
Ribbon cartridge OK (try a replacement)
Hammer penetration (if hammer fires but no print appears)
Configuration Switch settings
Host system and interface

If still won't print, follow initialization procedure in Table 6, Result 2.

TABLE 3

Symptom: Will not print

Condition: READY lamp "BLINKS"
ATTEND lamp "ON"

Corrective Action: Check the following and correct if necessary, rechecking status condition:

Access panel secure
Top cover secure
Paper supply
Ribbon out
User Switch settings

If still won't print, follow initialization procedures in Table 6, Result 2.

TABLE 4

Symptom: Will not print

Condition: READY lamp "BLINKS"
ATTEND lamp "OFF"

Corrective Action: Printer is in the "pause" mode. Press the "pause" switch for the READY condition.

TABLE 5

Symptom: Will not print

Condition: READY lamp "OFF"
ATTEND lamp "ON"
Short, audible alarm

Corrective Action: Perform the following steps in order, rechecking for condition after each step:

- o switch power "OFF", then "ON" again
- o replace main PCB and recheck lamps
- o replace carriage motor and its encoder PCB
- o replace carriage assembly and printwheel

TABLE 6

Symptom: Will not print

Condition: READY lamp "OFF"
ATTEND lamp "OFF"

Corrective Action: Listen to hear if fan is operating.

Result 1: Fan not operating

Corrective Action: Perform the following steps in order, rechecking for condition after each step:

- o check that AC power cord is plugged in
- o switch power "OFF", then "ON"
- o check AC line fuse (see Table 9)
- o replace AC power cord
- o check power supply PCB fuse (F1) (see Table 9)
- o replace power supply PCB
- o replace power switch

Result 2: Fan operating

Corrective Action: Check printer initialization

1. Switch power off
2. Remove top cover and defeat interlock
3. Push carriage assembly to center of printer
4. Put slack in ribbon cartridge
5. Rotate printwheel

CONTINUED ON NEXT PAGE

Restore power and watch for one of the following four conditions:

1. Printwheel rotates - if not, proceed to New Symptom A.

2. Carriage moves quickly to left side-frame, then slightly right to establish column zero - if not, proceed to New Symptom B.

3. The ribbon advances slightly to take up slack - if not, proceed to New Symptom C.

4. If no movement of any carriage assembly component, proceed to new symptom D.

New Symptom: A - No rotation of printwheel

Corrective Action: Perform each of the following steps in order, rechecking for condition after each step:

- o Check PW Disable Switch and P-9 connection on main PCB
- o Check PW encoder PCB connection
- o Replace PW pico fuse F-2 (see Table 9)
- o Replace main PCB
- o Replace carriage assembly and PW encoder PCB

New Symptom: B - No movement of carriage assembly

Corrective Action: Perform each of the following steps in order, rechecking for condition after each step:

- o Check CA Disable Switch and P-7 connector on main PCB
- o Check CM encoder PCB connection
- o Replace pico fuse F-1 (see Table 9)
- o Replace main PCB
- o Replace carriage drive motor and CM encoder PCB

New Symptom: C - No movement of ribbon

Corrective Action: Perform each of the following steps in order, rechecking for condition after each step:

- o Check the two connectors under the ribbon cartridge on the ribbon support plate for tight connection
- o Replace ribbon cartridge with known good one and recheck
- o Check connector P-9 on main PCB
- o Replace pico fuse F-3 (see Table 9)
- o Replace main PCB
- o Replace carriage assembly and PW encoder PCB

New Symptom: D - No movement of any carriage assembly components

Corrective Action: Perform each of the following steps in order, rechecking for condition after each step:

- o Check connector P-8 on main PCB and P-5 on power supply PCB
- o Replace F1 and F2 in power supply PCB (see Table 9)
- o Replace main PCB
- o Replace power supply PCB

TABLE 7

Symptom: Paper will not advance

Condition: READY lamp "ON"
ATTEND lamp "OFF"
Carriage assembly operational

Corrective Action: Perform the following in order, rechecking for condition after each step:

- o set user switches correctly
- o check connector P-10 on main PCB
- o check idler gear adjustment
- o perform Terminal Self-Test - If Pass, problem is host or interface
- o if Fail, replace F-3 (pico fuse) on main PCB (see Table 9).
- o replace main PCB

Symptom: Paper advances, but poor vertical registration

Corrective Action: Perform the following in order, rechecking for condition after each step:

- o adjust idler gear
- o perform Terminal Self-Test

Symptom: Paper advances backwards or with chatter

Corrective Action: Perform the following in order, rechecking for condition after each step:

- o check idler gear for chatter as gears mesh
- o check P-10 on main PCB; it could be backwards or seated on the wrong pins
- o replace main PCB
- o perform Terminal Self-test

TABLE 8

Symptom: Ribbon will not advance
Printwheel motor and carriage drive motor operational

Corrective Action:

- o remove ribbon and initialize to see if ribbon motor is operational
- o if operational, replace ribbon cartridge and perform Terminal Self-test
- o if non-operational, perform the following, rechecking condition after each step:

  replace pico fuse F-3 on main PCB (see Table 9)

  replace carriage assembly

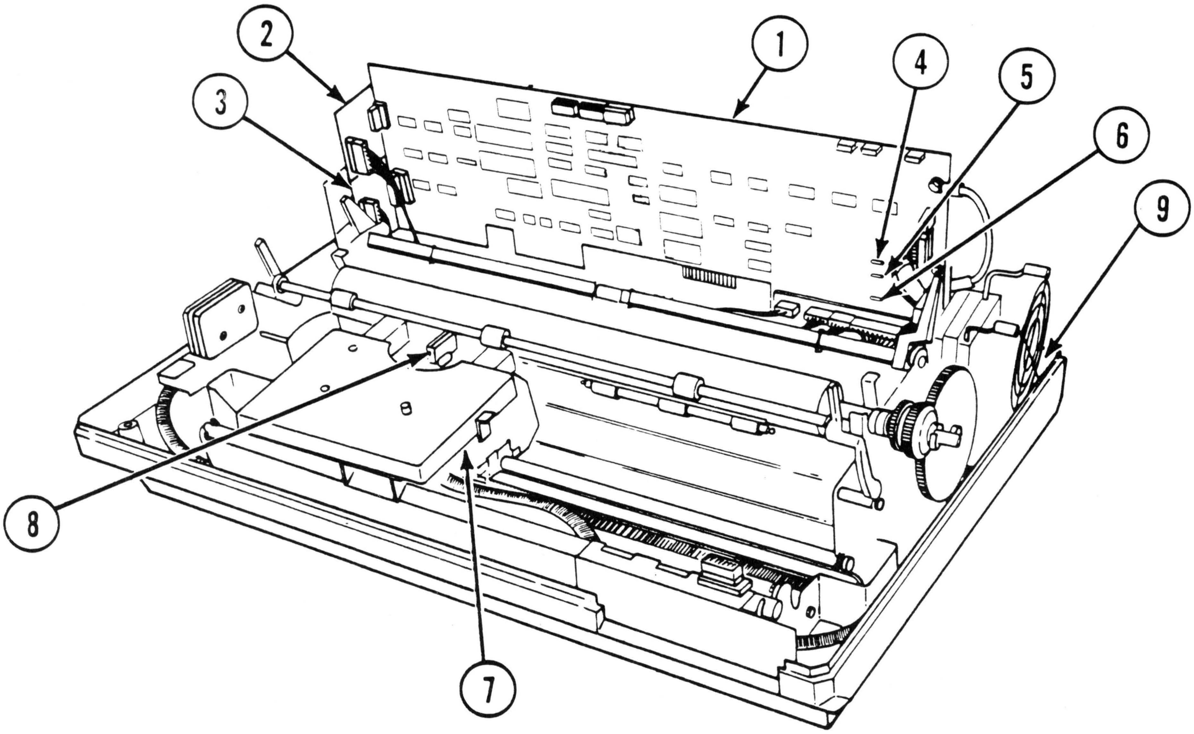


FIGURE 1

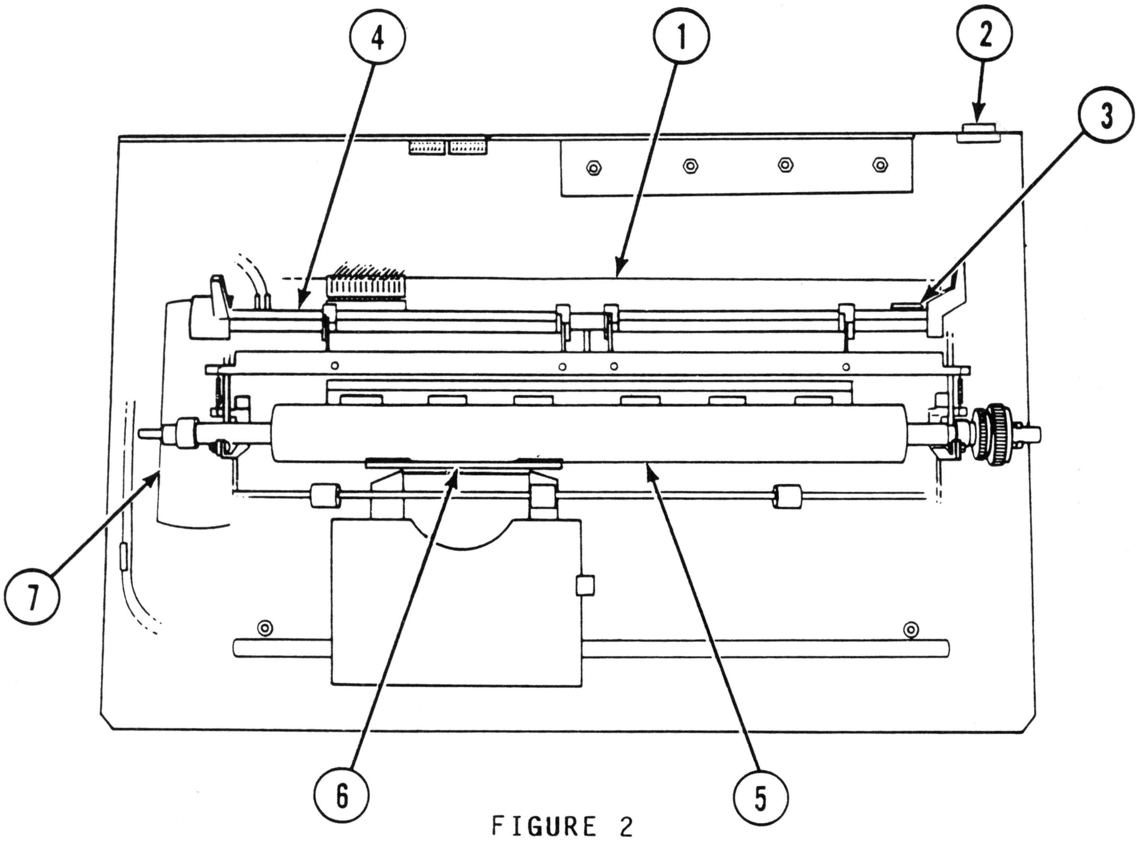


FIGURE 2

TABLE 9

FIELD LEVEL REPLACEABLE COMPONENTS

Printed Circuit Boards

Main PCB (Figure 1, #1)
Power Supply PCB (Figure 2, #1)
Printwheel encoder PCB (must also replace Carriage Assembly) - Figure 1, #2
Carriage Motor encoder PCB (must also replace Carriage Motor) - Figure 1, #3

Fuses

AC Line Fuse	-	5 amp (Figure 2, #2)
Power Supply PCB Fuses	-	F1, 5 amp or, in Europe, JP-1, 3 amp (Figure 2, #3)
	-	F2, 5 amp (Figure 2, #4)
Main PCB Pico Fuses	-	F1, 4 amp (Figure 1, #4)
	-	F2, 2 amp (Figure 1, #5)
	-	F3, 5 amp (Figure 1, #6)

Mechanical Components

Platen - Figure 2, #5
Ribbon Shield - Figure 2, #6
Carriage Drive Motor - Figure 2, #7 (with encoder PCB)
Carriage Assembly - Figure 1, #7 (with printwheel encoder PCB)
Print Hammer Assembly - Figure 1, #8
Power Switch - Figure 1, #9

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Apple Daisy Wheel Printer
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Section 5

Preventive Maintenance

Contents:

A. INTRODUCTION

Properly maintained, the Apple Daisy Wheel printer will give excellent service for many years. The following table summarizes the manufacturer's preventive maintenance requirements.

Operator or field service duties — perform as required:

1. Clean ribbon shield
2. Clean printwheel
3. Clean covers
4. Clean platen, feed rollers, paper bail rollers

Field Service — perform as required:

1. Replace felt wipers
2. Lubricate feed roller shafts
3. Check print quality (see section 1 above, p. 1.5)

Field Service — once a year or every 2000 operating hours

1. Clean and lubricate carriage drive shafts
2. Lubricate felt pad on paper feed idler gear stud
3. Lubricate carriage felt wipers

Field Service — once every two years or 4000 operating hours

1. Lubricate platen sleeve

Field Service — required only in very harsh environments

1. Clean print hammer
2. Lubricate drive belt pulley

NOTES:

1. These procedures are designed for normal environments. Printers in exceptionally harsh operating environments may require different or more frequent preventive maintenance (see section E).

2. Use only the recommended types of cleaners, lubricants, etc.

3. Clean plastic parts only with a low residue cleaner such as rubbing alcohol; do not use high residue cleaners such as soaps; **NEVER** use solvent based cleaners (such as those containing toluene), as they will destroy the plastic.

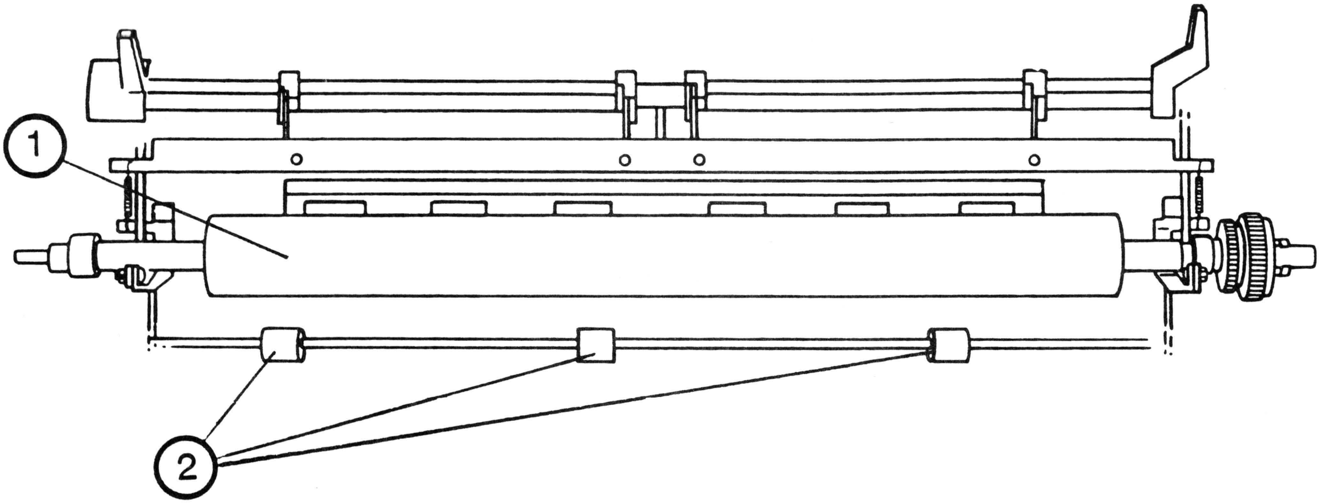


FIGURE 1

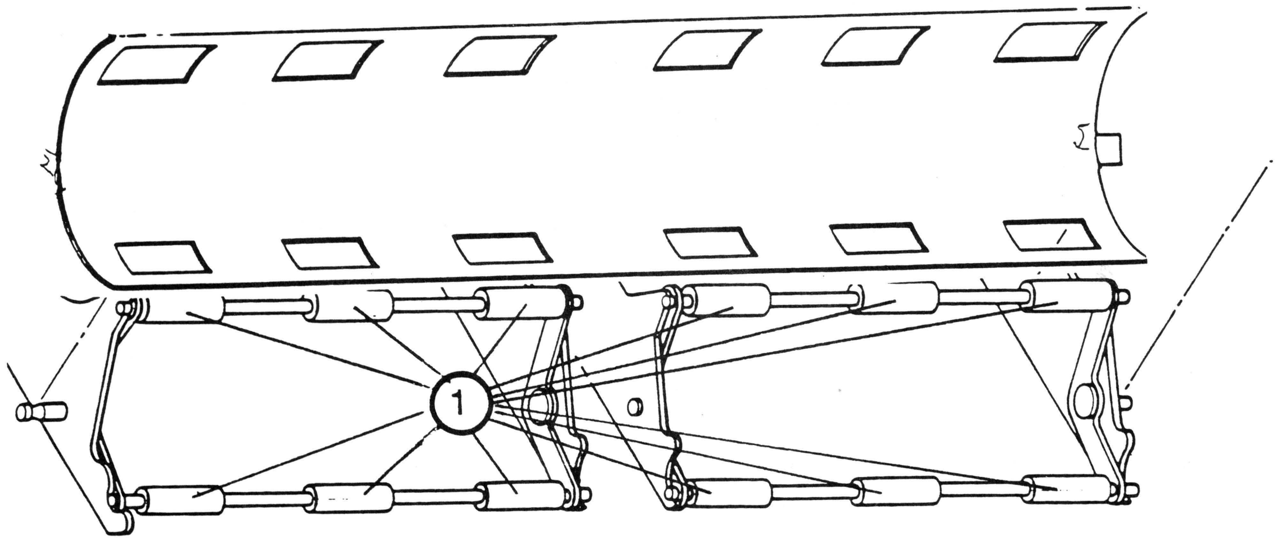


FIGURE 2

B. CLEANING

Printwheel:

1. Remove printwheel.

2. Soak printwheel in low residue cleaner such as alcohol.

3. Use medium stiff brush to clean (gently).

4. Thoroughly rinse and dry.

5. Reinstall when dry.

NOTE: DWP's that use a fabric-based ribbon may require more frequent printwheel cleaning.

Platen, Feed Rollers, Paper Bail Rollers (Rubber Parts):

1. Remove top cover, ribbon cartridge and printwheel.

2. Remove platen.

3. Lift platen cradle out of the way (see Figure 2).

4. Moisten a soft cloth with Fedron platen cleaner and clean platen (Figure 1, #1), paper bail rollers (Figure 1, #2), and feed rollers (Figure 2, #1).

CAUTION: FEDRON SHOULD BE USED ONLY IN A WELL VENTILATED AREA. DO NOT USE FEDRON ON PLASTIC PARTS.

NOTE: It is important to use an approved platen cleaner, such as Fedron brand. The platen must offer a specific resiliency to the print hammer. Platen cleaner restores resiliency; other solvents will harden the platen and cause impaired printer performance.

Ribbon Shield and Metal Parts:

1. Remove top cover, ribbon cartridge, printwheel and platen.

2. Clean the ribbon shield and other metal parts with a soft rag and a safe degreasing agent (such as isopropyl alcohol or Freon).

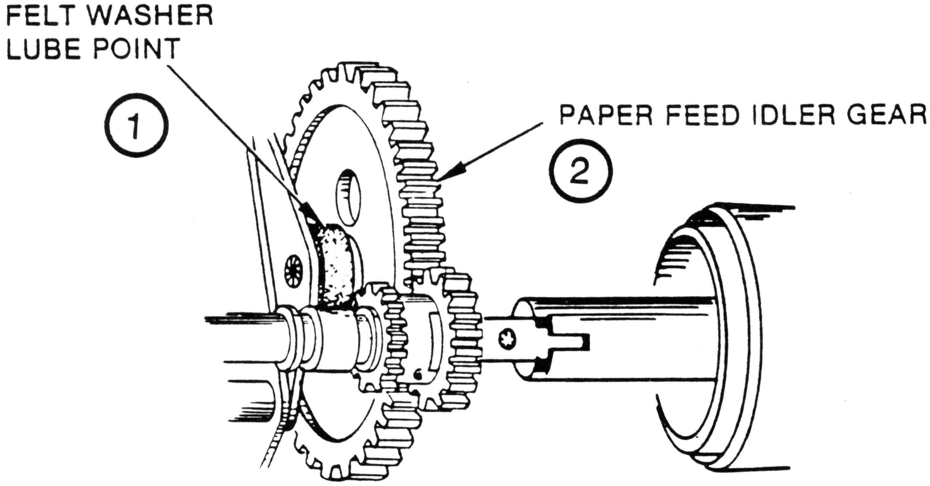


FIGURE 3

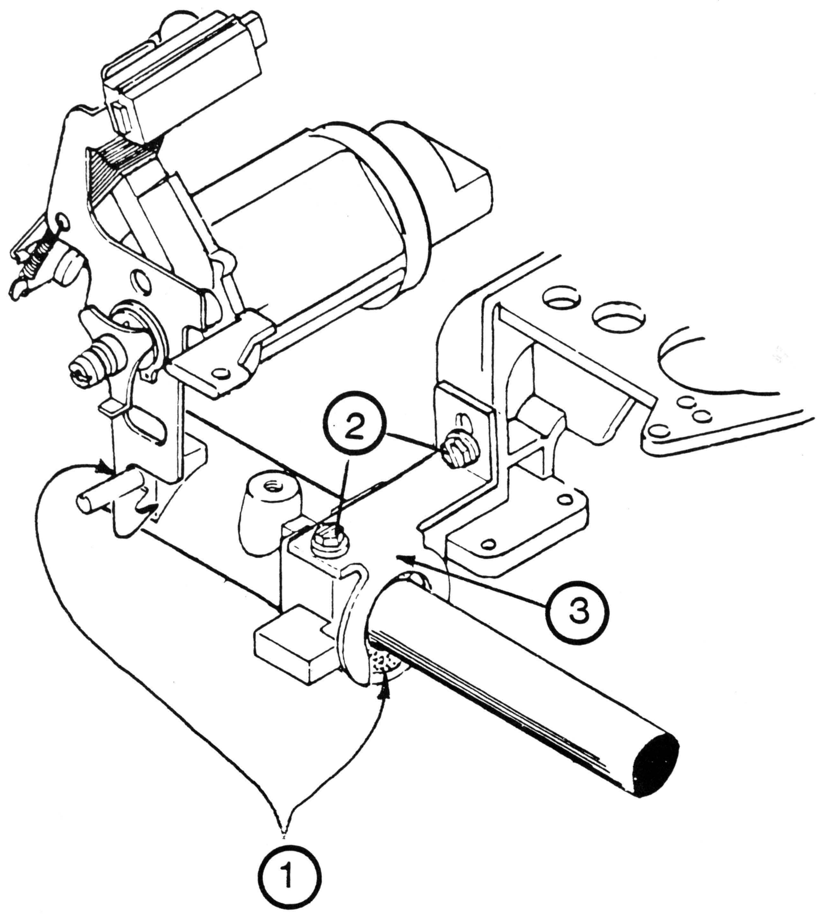


FIGURE 4

C. LUBRICATION - ONE YEAR CYCLE

Once every year or every 2000 hours, perform the following lubrications:

1. **Felt Pad on Paper Feed Idler Gear Stud:**

   Once a year, or every 2000 operating hours, lubricate the felt washer behind the paper feed idler gear (see Figure 3, #1) with ten drops of Tellus #46 oil. Wipe off any excess oil. Do not lubricate the idler gear itself (Figure 3, #2).

2. **Carriage Drive Shaft and Felt Wipers:**

   There are two felt wipers on the rear carriage guide shaft (see Figure 4, #1). Once a year, or every 2000 hours:

   a) Wipe the carriage drive shaft clean with a soft cloth moistened with isopropyl alcohol or freon.

   b) Use a 3/16 inch wrench and/or a small screwdriver to remove the two screws (Figure 4, #2) on the retaining clamp (Figure 4, #3) on each side of the carriage assembly (Figure 4 shows only one side). Inspect the felt wiper. If very worn or dirty, remove and replace it. Otherwise, go on to step c.

   c) Lubricate both left and right wipers with Tellus #46 oil. If wipers are new, use 10 drops on each; if not new, use 5 drops each.

   d) Slide the carriage assembly back and forth to lubricate the shaft.

   e) Wipe off excess oil with a clean dry cloth and repeat step d).

3. **Clean and lubricate the front carriage guide shaft:**

   Once a year, or every 2000 operating hours:

   a) Clean the front guide guide shaft with a soft cloth moistened with isopropyl alcohol or freon.

   b) Apply 3 drops of Tellus #46 oil with a cotton swab.

   c) Slide the carriage back and forth to lubricate the shaft.

   d) Wipe off excess oil with a clean dry cloth and repeat step c).

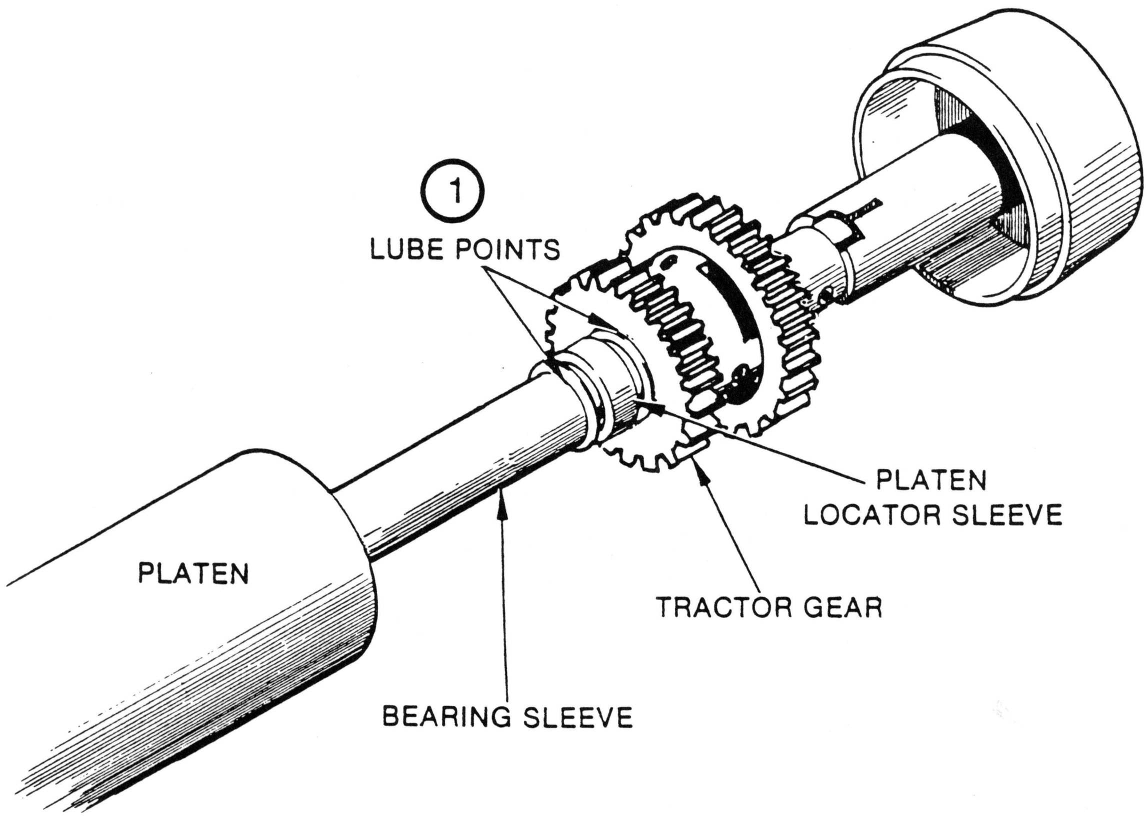

1
LUBE POINTS
PLATEN
LOCATOR SLEEVE
PLATEN
TRACTOR GEAR
BEARING SLEEVE

FIGURE 5

D. LUBRICATION - TWO YEAR CYCLE

Once every two years, perform the following lubrication:

Platen Sleeve Bearings:

1. Remove top cover and platen.

2. Place two drops of Tellus #46 oil at one end of the platen sleeve (see Figure 5, #1), and hold the platen vertical so that the oil flows down the shaft.

3. Twirl the sleeve to distribute the oil evenly; then wipe off excess oil. Avoid getting oil on the platen surface.

4. Repeat steps 2 and 3 for the other end of the platen.

5. Replace platen and top cover.

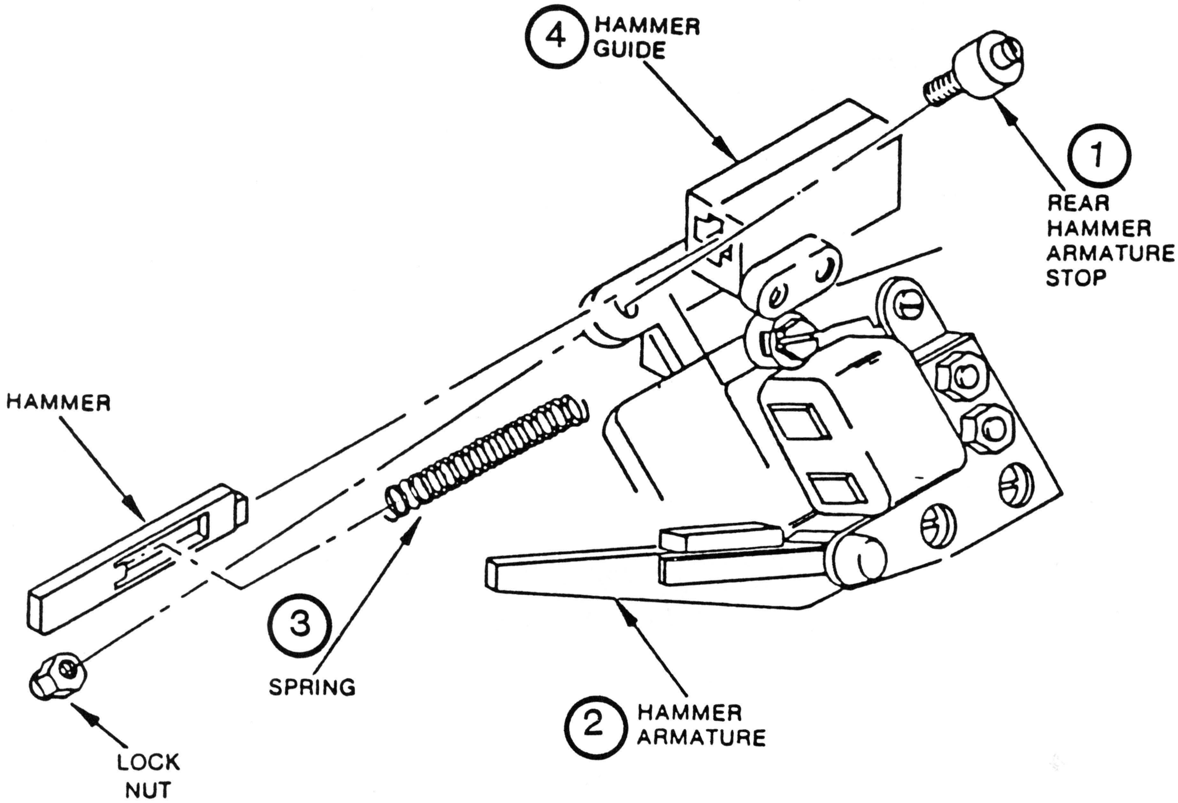

4 HAMMER GUIDE
1 REAR HAMMER ARMATURE STOP
HAMMER
3 SPRING
2 HAMMER ARMATURE
LOCK NUT

FIGURE 6

E. SPECIAL MAINTENANCE FOR HARSH ENVIRONMENTS

Where printers are subjected to airborne dirt and corrosive substances, the print hammer may need occasional cleaning and lubrication. This is not necessary under normal operating conditions.

1. Disconnect AC power cord. Remove the access cover and ribbon cartridge. Unplug the connector on the hammer coil.

2. Remove the rear hammer armature stop (Figure 6, #1) and allow the armature to pivot toward the front of the printer (toward the operator) (see Figure 6, #2).

3. Being careful to hold on to the hammer spring (Figure 6, #3) so it will not be lost, remove the print hammer from the hammer guide (Figure 6, #4) by sliding it out toward the front of the printer. Remove and retain the spring.

4. Clean both the hammer and the inside of the hammer guide with isopropyl alcohol or Freon solvent. Use a cotton swab moistened with solvent to clean inside the hammer guide. DO NOT USE SPRAY SOLVENTS.

5. Carefully replace the spring inside the hammer and install the hammer in the hammer guide. (Note that the face of the hammer is wedge-shaped. Install the hammer with the wide end of the wedge up.)

6. Pivot the hammer armature against the print hammer coil and reinstall the rear stop and locknut. Reconnect the hammer coil connector.

7. Adjust the rear hammer armature stop (see Adjustments job aids, p. 3.17).

8. Replace the ribbon cartridge and the access cover.

9. Perform terminal self-test to check print quality and make any necessary hammer adjustments.

Keyboards

apple computer inc.

KEYBOARD TECHNICAL PROCEDURES

TABLE OF CONTENTS

Keyboards Technical Procedures

Section 1

Keyswitch Replacement

Contents:

KEY SWITCH REPLACEMENT PROCEDURES FOR THE APPLE][

For this procedure you will need:

Soldering iron (60 watt, 700 degrees)
Solder sucker
60/40 resin core solder
#1 Phillips screwdriver

Apple]['s have keyboards with three different types of keyswitches: those that screw on, those that snap on, and those that cannot be replaced.

1. Screw-on switches are on keyboards that have both screws and traces on the underneath side of the board of the mechanical assembly.

2. Snap-on switches are on keyboards that have traces but no screws on the underneath side of the board of the mechanical assembly.

3. Keys that are not replaceable are on the newest keyboards which have screws but no traces on the underneath side of the board of the mechanical assembly. If any switch fails, you replace the entire mechanical assembly.

CHANGING A KEYSWITCH: SCREW FASTENED SWITCHES

REMOVING THE KEYSWITCH

1. To determine which key you want to remove, look at Figure A and find the number corresponding to the desired key. Locate that number on the back of the keyboard.

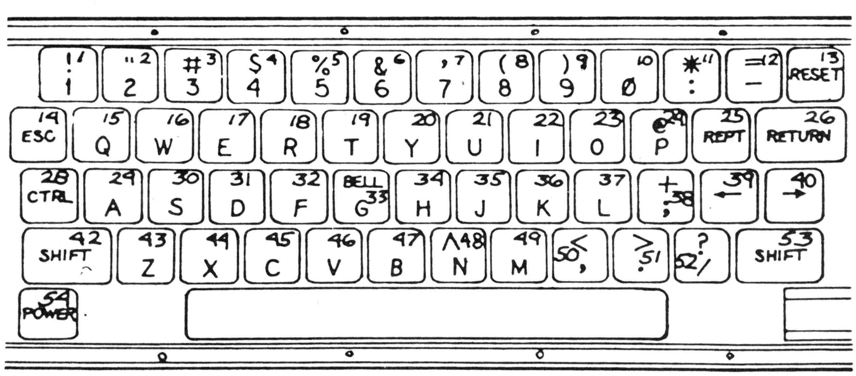


FIGURE A

2. Prepare the solder sucker by pushing the plunger down as far as it will go.

3. Heat the soldering iron and make sure it is clean and well-tinned.

4. When the soldering iron is ready, put a small drop of fresh solder on each connection. This will facilitate melting and removal of the old solder.

5. Hold the soldering iron and the solder-sucker as shown in Figure B. The tip of the iron should be firmly in contact with both the pin and the pad at the base of the pin.

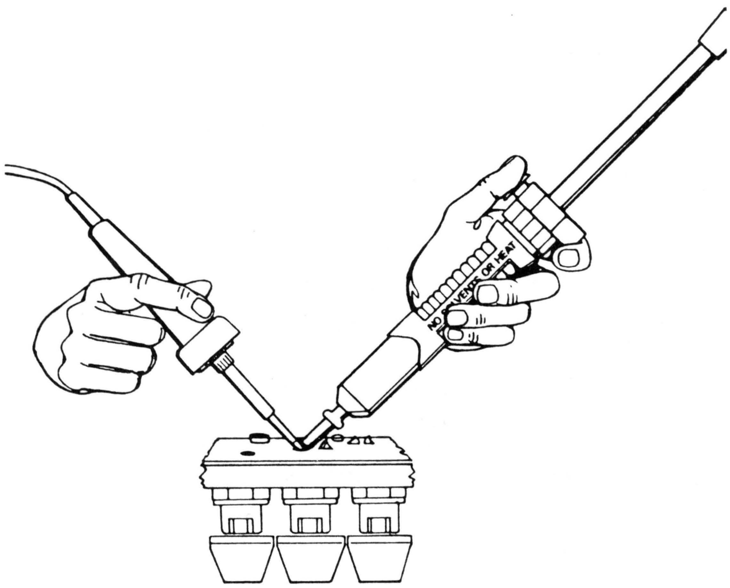


FIGURE B

6. When the solder melts, quickly remove the iron, place the solder sucker vertically over the connection, and push the release button or lever to pick up the solder.

CAUTION: Do not apply the soldering iron for more than three seconds. It may lift the traces off the board and destroy it.

7. Repeat this procedure for the second pin, being careful to observe the 3-second limit.

8. If any solder remains around the base of the pin, apply a little solder to the joint and repeat steps 5 & 6 to make sure all solder is removed.

9. Remove the screw holding the keyswitch to the board.

10. Turn the keyboard right-side up and pull up on the key cap to remove the switch assembly.

INSTALLING THE SWITCH

11. Insert the keyswitch into the board so that the pins go through the holes.

12. Holding the key in place with one hand, turn the keyboard upside-down onto the pad.

13. Reinstall the screw that holds the key in place.

14. Apply a little solder to the iron. Then, with the tip in contact with both the pin and the pad that surrounds the pin hole, apply the new solder.

CAUTION: Don't overheat the board!

15. Check the joint to be sure that the solder has completely filled the hole around the pin and that the solder is built up in a little cone around the pin. If the joint is not filled, apply more solder.

CHANGING A KEYSWITCH: SNAP ON KEYS

REMOVING THE KEYSWITCH

1. Locate the desired key. (See Figure C.)

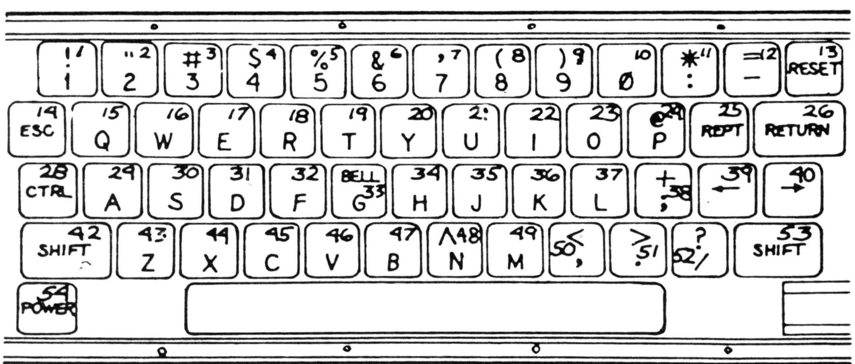


FIGURE C

2. Put a little resin core solder on the joints.

3. Cock the solder sucker by pushing the plunger down as far as it will go.

4. Hold the soldering iron and the solder sucker as shown in Figure D. The tip of the iron should be firmly in contact with both the pin and the pad at the base of the pin.

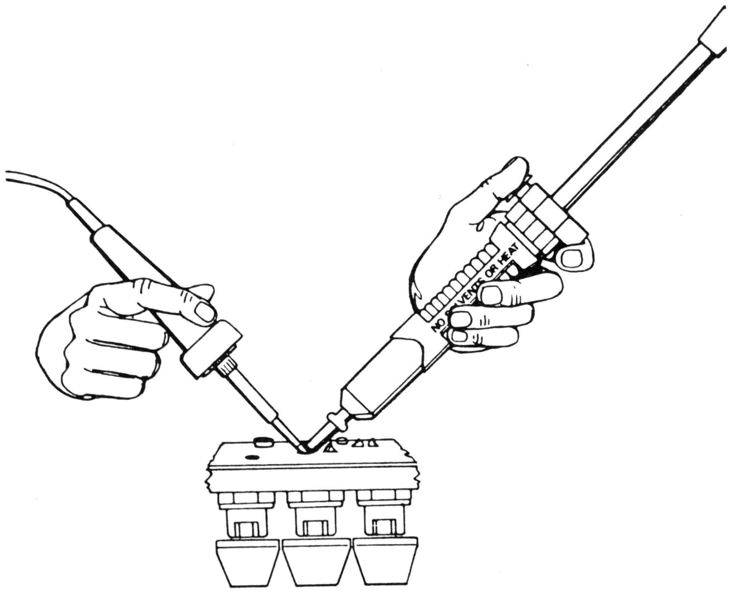


FIGURE D

5. When the solder melts, quickly remove the iron, place the solder sucker vertically over the connection, and push the release button or lever to pick up the solder. Make sure that all the solder is removed.

CAUTION: Do not apply the soldering iron for more than three seconds, It may lift the traces off the board and destroy it.

6. Repeat this procedure for the second pin. Be careful to observe the three second limit.

7. If any solder remains around the base of the pin, apply a little solder to the joint and repeat steps 4-6 to make sure all solder is removed.

8. Turn the keyboard over.

9. Take the key cap off.

10. With one pair of needlenose pliers, pinch the two clips on the keyswitch together.

11. With the other pair of needlenose pliers, remove the keyswitch.

INSTALLING THE SWITCH

12. Thread the pins of the keyswitch through the holes.

13. Snap the switch into place.

14. Replace the keycap.

15. Solder the pins into place. Apply a little solder to the soldering iron. With the tip in contact with both the pin and the pad that surrounds the pin hole, apply the new solder.

CAUTION: Don't overheat the board!

16. Check the joint to be sure that the solder is built up in little cone around the pin. If the joint is not filled, apply more solder.

NUMERIC KEYPAD

NUMERIC KEYPAD TECHNICAL PROCEDURES

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Numeric Keypad Technical Procedures

Section 1

Troubleshooting
Assembly/Disassembly

Contents:

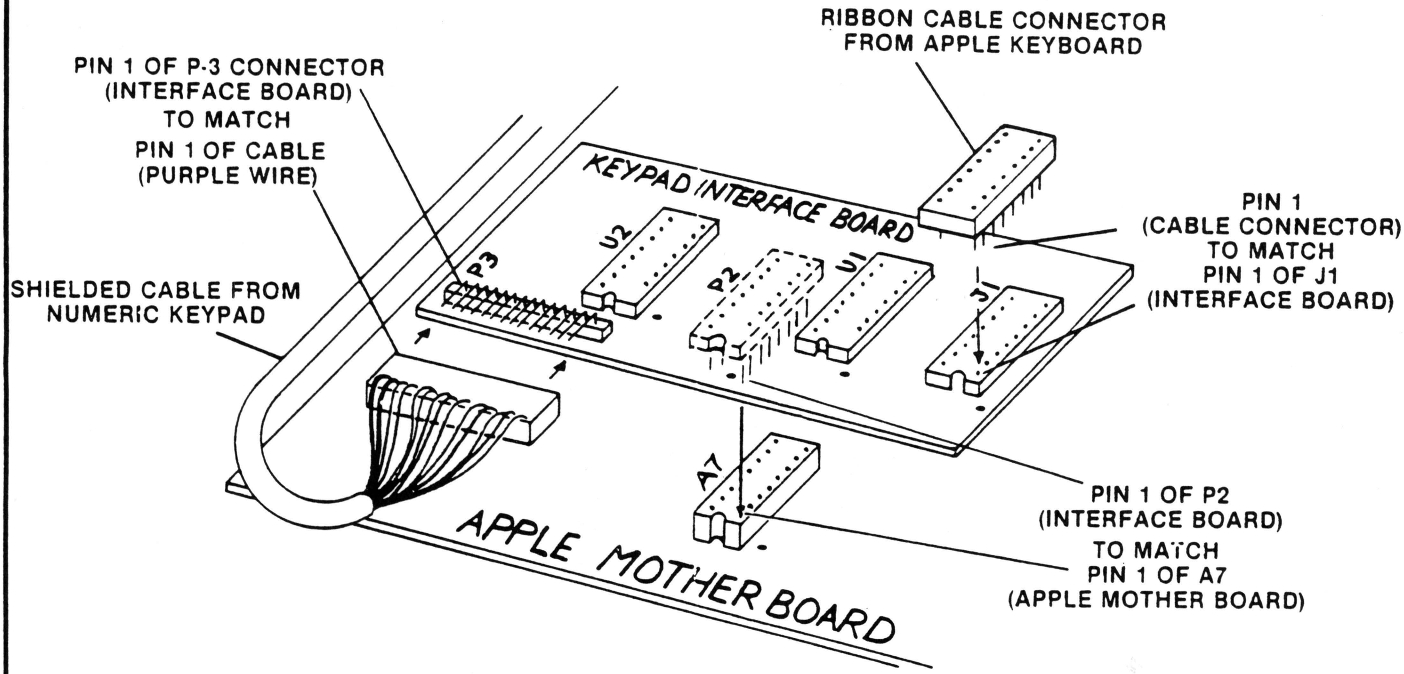

RIBBON CABLE CONNECTOR
FROM APPLE KEYBOARD
PIN 1 OF P-3 CONNECTOR
(INTERFACE BOARD)
TO MATCH
PIN 1 OF CABLE
(PURPLE WIRE)
SHIELDED CABLE FROM
NUMERIC KEYPAD
KEYPAD INTERFACE BOARD
U2
P3
P2
U1
J1
PIN 1
(CABLE CONNECTOR)
TO MATCH
PIN 1 OF J1
(INTERFACE BOARD)
A7
PIN 1 OF P2
(INTERFACE BOARD)
TO MATCH
PIN 1 OF A7
(APPLE MOTHER BOARD)
APPLE MOTHER BOARD

FIGURE A

A. TROUBLESHOOTING GUIDE FOR THE NUMERIC KEYPAD

1. Confirm that the keypad is malfunctioning by running keyboard test of Dealer Diagnostic diskette.

When you have isolated the malfunction to the numeric keypad, determine the failed component by performing the following steps:

2. Complete steps 1a. through 1i. of ASSEMBLY/DISASSEMBLY INSTRUCTIONS (on following pages) to gain access to and remove the keypad interface board.

3. Swap the interface board with a known good unit (from spares kit), reconnecting pins and cables as shown in Figure A.

4. Test the keypad using the Dealer Diagnostic diskette keyboard test. If the pad now works, reassemble the Apple II. If the pad doesn't work, put the old interface board back in and go to the next step.

5. Swap the cable, following steps 1j and 2 to 12 of the Assembly/Disassembly instructions. (see reminder below)

6. Test the keypad using the Dealer Diagnostic diskette keyboard test. If the pad now works, reassemble the Apple II. If the pad doesn't work, remove the new cable and use the old cable in the next step.

7. Swap the keypad assembly following steps 7 to 12 of the Assembly/Disassembly instructions. (see reminder below)

8. Test the keypad using the Dealer Diagnostic diskette keyboard test. If the pad now works, reassemble it and the Apple II (steps 13 to 15 of the Assembly/Disassembly intructions). The pad SHOULD work. If it doesn't, you have defective exchange modules. Find new exchange modules and start from step 3 above.

REMINDER: Before swapping ANY unit, POWER DOWN THE SYSTEM AND REMOVE POWER CORD FROM THE APPLE.

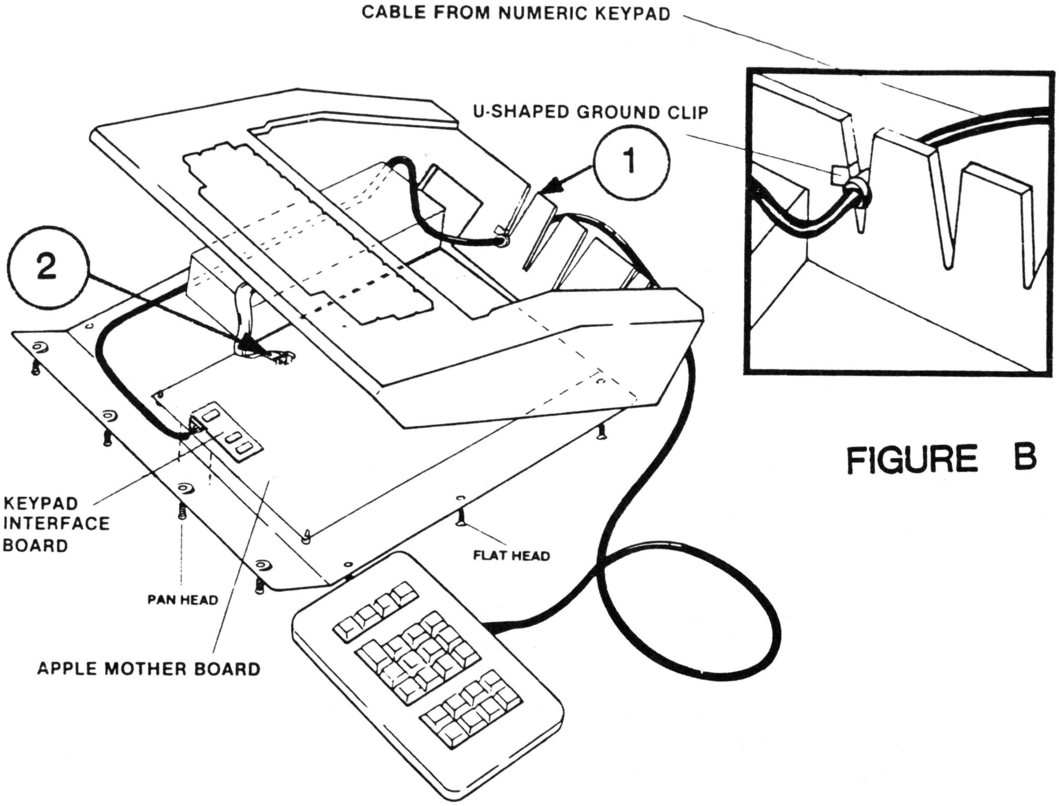


FIGURE B

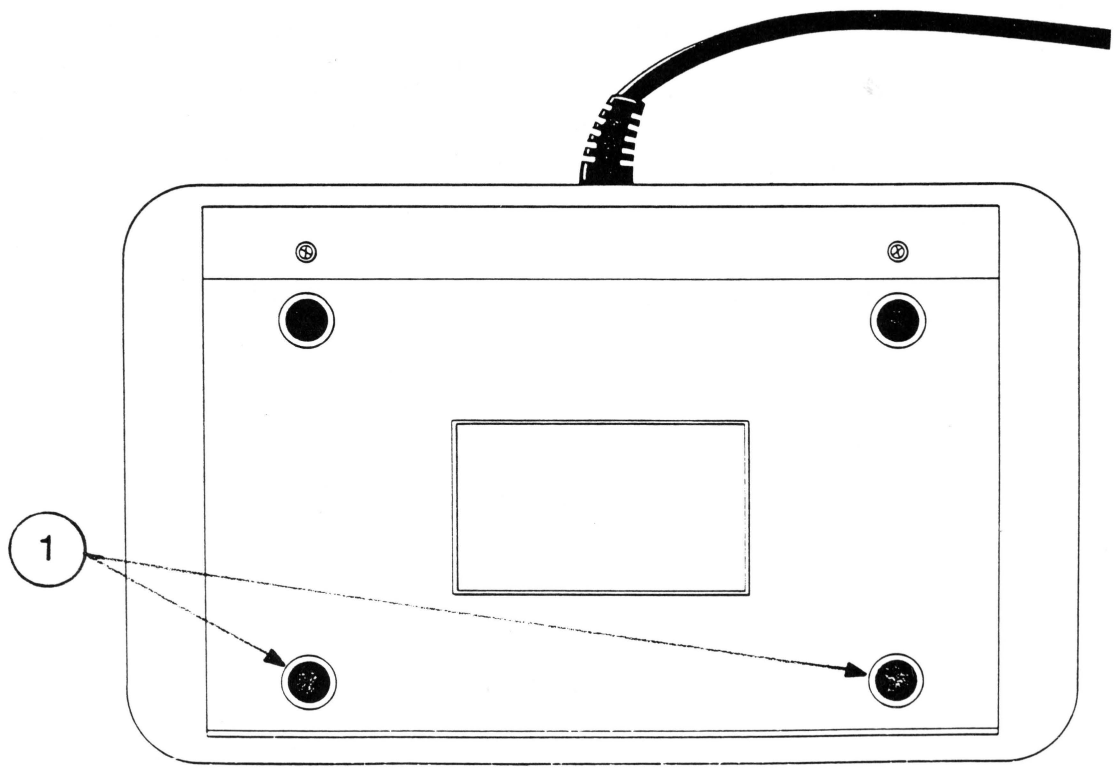


FIGURE C

B. ASSEMBLY/DISASSEMBLY INSTRUCTIONS FOR THE NUMERIC KEYPAD

Items needed:

Dealer Diagnostic diskette
Medium Phillips screwdriver
Soldering iron, solder, solder wick
Replacement modules (interface card, cable, keypad assembly)
Foam pad

DISCONNECTING KEYPAD FROM APPLE

1. Complete these steps to disconnect the numeric keypad from the Apple.

   a. Power off the system and remove power cord -- first from the wall source and then from the rear of the Apple Housing.
   b. Remove Apple lid. Except for keypad cable, disconnect all other external cables connected to the Apple.
   c. Turn Apple upside down so keyboard rests on protective foam pad.
   d. Remove six flat-head screws from three outside edges of flat portion of Apple base.
   e. Remove four pan-head screws and lock washers from front of base.
   f. Holding both base and housing, turn Apple right side up. (On newer Apple II's, it may be necessary to additionally remove four round head-screws and lock washers along the rear of the Apple that fasten the mother board to the base.)
   g. Gently lift the front of the housing slightly off the base and unplug keyboard connector (see Figure B, #2) from keypad interface board.
   h. Grasp keypad interface board firmly and gently lift from motherboard.
   i. Lift housing off base and set aside (careful - keypad cable still attached)

   Do NOT proceed to next step unless you are swapping the cable or keypad assembly. Return to #3 of Troubleshooting Guide.

   j. Unthread cable through notch in rear of Apple. (see Figure B, #1)

SWAPPING THE CABLE & KEYPAD ASSEMBLY

2. Remove the 2 exposed Phillips screws on bottom of keypad case.

3. Remove the 2 LOWER rubber feet. They just pry off. (See Figure C, #1)

Continue on page following illustrations.

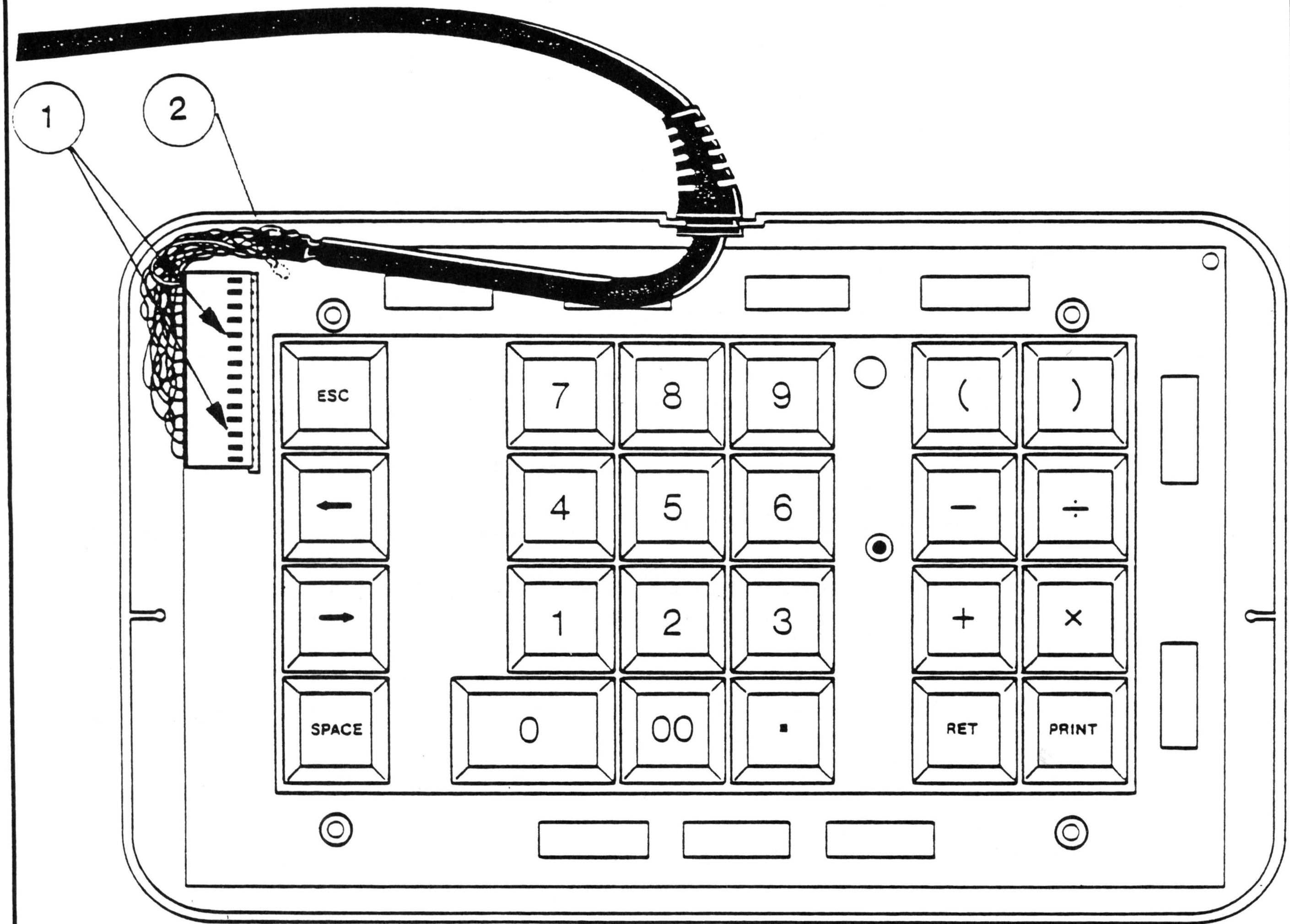


FIGURE D

4. Remove the 2 screws that are under the rubber feet you just removed.

5. Holding the case top to the bottom, turn the pad back over.

6. Remove case top by lifting off.

7. If you are replacing the CABLE ONLY, skip this step. Get the exchange keypad assembly from spares kit and set it next to the customer's keypad assembly. Pry off the key caps ONE AT A TIME, placing the cap from the customer's pad on to the new pad at the same location.

8. Note how the cable is laid and how it exits the case as shown in Figure D. Lift out customer's pad and place on normal soldering surface. (This step might not be applicable in swapping the keypad assembly.)

9. Carefully unplug the cable connector noting that the grooves of the cable connector are face up (see Figure D, #1).

10. Use a soldering iron to unsolder the grounding wire that is attached to the upper left side of the pad (see Figure D, #2)..

11. Get the appropriate cable (new one if you are replacing the cable, old one if this is a keypad swap) and plug it into the appropriate keypad assembly (old pad if this is a "cable only" swap, new pad if you are replacing the customer's pad). Note that the grooves of the cable connector are face up (see Figure D, #1).

12. Solder the ground wire to the designated area at the upper left side of the pad (see Figure D, #2).

STOP HERE! If you are CABLE SWAPPING, return to step 6 of the Troubleshooting Guide. If you are SWAPPING THE KEYPAD ASSEMBLY, return to step 8 of the Troubleshooting Guide. Do NOT reassemble keypad at this point.

13. When reassembling keypad, be sure the cable is laid correctly in the case bottom and that it points down as it exits the case as shown in Figure D. Be careful that all wires are set INSIDE the bottom of the case so none get pinched when the top is secured in place.

14. Replace case top. Turn pad over and replace 4 screws and LOWER rubber feet.

Continue on page following illustrations.

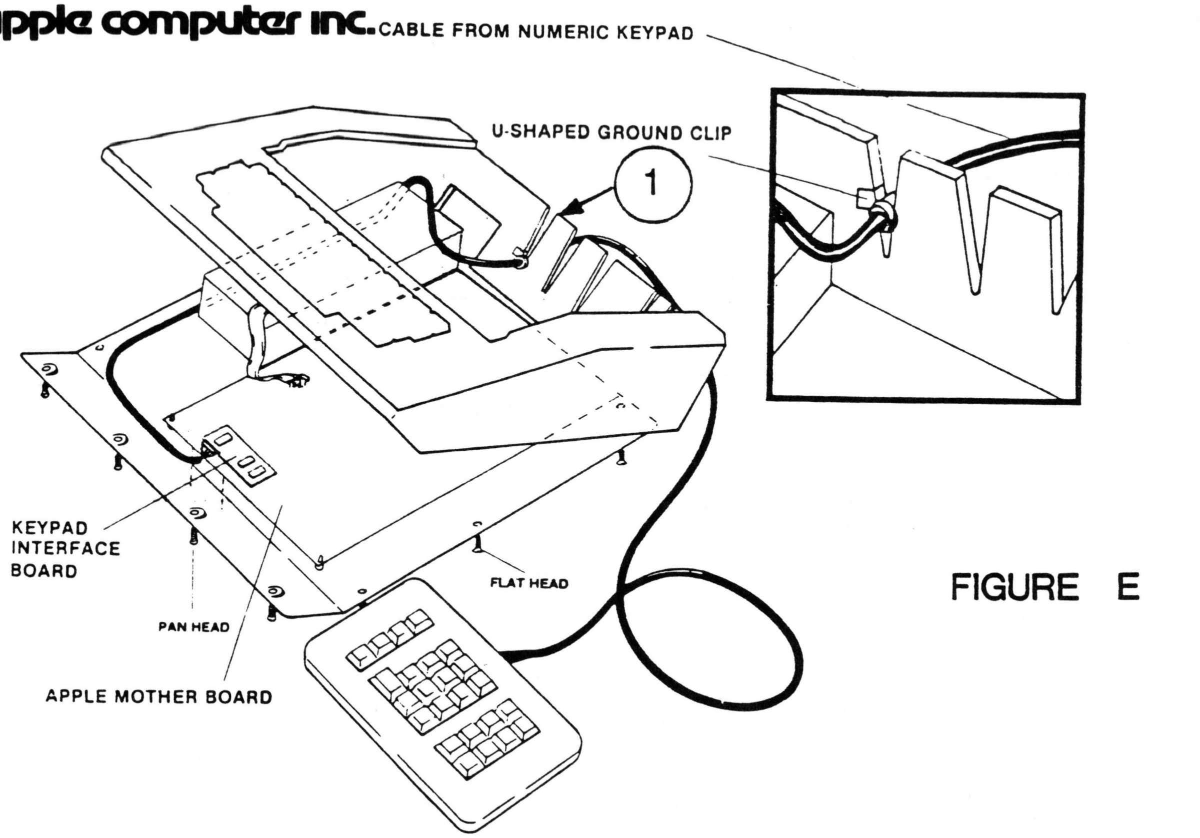


FIGURE E

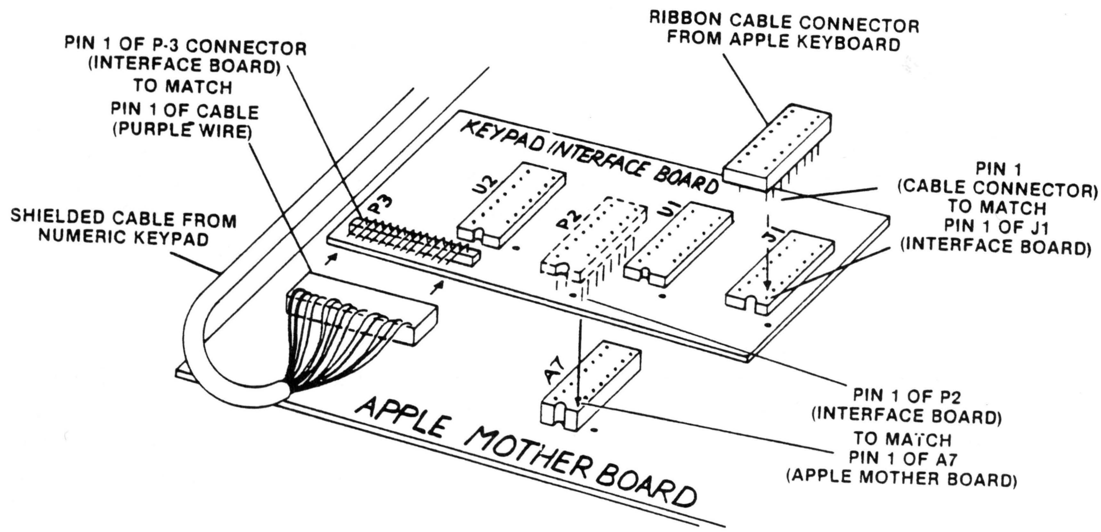


FIGURE F

RECONNECTING KEYPAD TO APPLE

15. Complete these steps to reconnect numeric keypad to Apple.

    a. Set housing back on Apple base (do NOT set screws in place yet!)
    b. Thread the cable through a notch in the rear of your Apple.
    c. Slide the little u-shaped ground clip on the cable down the edge of the notch to secure the ground to the Apple case. (see Figure E, #1)
    d. Plug interface board connector P2 into mother board socket at A7. Be sure to match up P2 pin 1 to A7 pin 1. Plug keyboard connector into keypad interface board connector J1. Be sure to match up pin 1 - J1 to pin 1 keyboard connector. (see Figure F)
    e. Holding both base and housing, turn Apple upside down so keyboard rests on foam pad.
    f. Install four lock washers and pan-head screws at front of base.
    g. Install six flat-head screws at three outside edges of Apple base.
    h. Turn Apple right side up, reinstall lid, and reconnect other cable connected items and the power cord to Apple.

APPLE LEVEL I TECHNICAL PROCEDURES MANUAL
DOCUMENT CONTROL SHEET #1

This is the July 1, 1983 version of the Level I Technical Procedures manual (Part Number 072-0062). The manual has not been updated.

THIS IS UPDATE NUMBER 1

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